

LEPTANTHURA AND NEW RELATED GENERA
(CRUSTACEA, ISOPODA, ANTHURIDEA)
FROM EASTERN AUSTRALIA

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Abstract

Diagnoses are presented for the genus *Leptanthura* and its three species from eastern Australia: *L. diemenensis* (Haswell), *L. nunana* n. sp. and *L. kapala* n. sp. Two related blind genera, *Bullowanthura* n.g. and *Ulakanthura* n.g., are described. One species of *Bullowanthura*, *B. pambula* n. sp., and six of *Ulakanthura*: *U. crassicornis* (Haswell), *U. colac* n. sp., *U. cooma* n. sp., *U. lara* n. sp., *U. namoo* n. sp. and *U. wanda* n. sp.; are described from coastal environments of southern Queensland, New South Wales and Victoria. Keys to Australian species of *Leptanthura* and *Ulakanthura* are presented and the relationships of the three genera discussed. All species and the two new genera are endemic to Australia. *Ulakanthura* shows a high degree of speciation, typical of peracarid genera in the region. *Paranthura australis* is designated nomen dubium.

Introduction

Discovery of numerous species of isopods of the family Paranthuridae in collections of soft-bottom benthos from southern and eastern Australia has led to a re-examination of existing Australian species. In the 1880s W. A. Haswell described three species of *Paranthura* which were subsequently placed in *Leptanthura* by K. H. Barnard in 1925. The 'types' of only two of these remain. One is indeed a *Leptanthura*, the other belongs to a hitherto undescribed genus, and the third of Haswell's species remains unknown.

The Paranthuridae are anthuridean isopods with elongate pointed mouthparts. This paper deals with three genera which lack eyes and have small, triangular articles 5 on pereopods 4-7. Three species of *Leptanthura*, two of which are new, are described and a new generic diagnosis presented. Two new related genera are diagnosed, *Bullowanthura* with one species and *Ulakanthura* with six species. The relationships between the three genera within the Paranthuridae are discussed and keys to Australian species of *Leptanthura* and *Ulakanthura* are given.

Nomenclature used is similar to that in Barnard's (1925) review of the Anthuridea and in my previous study of anthurids (Poore, 1975). The only difference is in referring to the num-

ber of articles in the maxillipedal palp rather than those of the whole maxilliped. In all anthurideans the first article of the maxilliped is fused to the head and, in *Leptanthura* and some other genera, the second (the basis), is also. The remaining articles, which constitute the palp, are free. Unless otherwise marked all scales on the figures are equivalent to 0.1 mm.

Material for this study has come from the following surveys and institutions:

Port Phillip Bay Environmental Study (PPBES) and Crib Point Benthic Survey (CPBS), both carried out by the Marine Studies Group, Fisheries and Wildlife Division, Ministry for Conservation, Melbourne, Victoria;

Shelf Benthic Survey (AMSBS) and Hunter District Water Board Survey (HDWBS) both carried out by the Australian Museum, Sydney, New South Wales;

N.S.W. State Pollution Control Commission (SPCC) survey of Botany Bay, 1976-77 (material lodged in the Australian Museum);

Moreton Bay benthic studies (QUBS) of the Department of Zoology, University of Queensland, Brisbane, Queensland.

Material has been deposited in the National Museum of Victoria (NMV), Melbourne, the Australian Museum (AM), Sydney, and the Queensland Museum (QM), Brisbane.

PARANTHURIDAE Menzies and Glynn

Leptanthura Sars

Leptanthura Sars, 1899: 47-48.—Barnard, 1925: 149-150.—Wolff, 1956: 137.—Menzies, 1962: 193.—Birstein, 1963: 138.

Diagnosis: Paranthuridae without eyes. Pereon with feeble dorsolateral grooves, otherwise smooth; perconites 4-6 sometimes with small dorsal pits. Pleonites distinct. Telson thin, concave dorsally, not indurated; a single statocyst opening by a dorsal pore proximally. Uropodal endopod usually barely exceeding telson, exopod usually broad and erect. Antenna 1 flagellum rudimentary, of 3-4 articles. Antenna 2 flagellum rudimentary, of 4-5 articles. Mandible with a 3-articulate palp, article 2 the longest, article 3 short and narrow and with 1-2 terminal spines. Maxilliped elongate, basis fused on to head; endite obsolete; palp less than $\frac{1}{3}$ of total length and of up to 3 poorly-separated setose articles. Pereopod 1 stout, subchelate, palm entire or with a proximal thumb, axial to oblique. Pereopods 2, 3 less well developed than first. Pereopods 4-7 with article 5 triangular and lacking a free anterior margin. Pleopod 1 operculiform, not or only slightly indurated. Adult male characterized by more elongate form than juvenile or female and bearing a multi-articulate setose flagellum on antenna 1. Females with oostegites on pereonites 2-5.

Type species: *Paranthura tenuis* Sars, 1872.

Remarks: *Leptanthura* is a clearly defined genus of about 19 remarkably similar species. The diagnosis given here is essentially that of Barnard (1925) and of Menzies (1962). Differences are in allowance for dorsal pits which are noted on Australian species and a less rigid definition of the number of articles in the maxilliped. The maxillipedal palp was defined as a single article by Barnard (1925) but more recent authors (Birstein, 1963; Kensley, 1975) have noted additional minute articles on this appendage. These terminal articles could easily have been overlooked by earlier authors. Barnard (1925) placed great value in use of the number of articles in the maxilliped

in generic definitions of the Anthuridea. Over-reliance on this character in the Paranthuridae may not be warranted. In spite of variability in this character the genus *Leptanthura* at least remains fairly homogeneous. The structure of the mandibular palp, lack of eyes and the form of the limbs are consistent throughout the genus.

Species of *Leptanthura* are known from shelf and bathyal waters of most areas of the world except around North and South America. The Australian species, *L. diemenensis*, is the only one known from the intertidal zone (Haswell, 1884).

KEY TO AUSTRALIAN SPECIES OF
LEPTANTHURA

- 1 Exopod of uropod acute, lanceolate; telson reaching little beyond base of endopod *L. nunana*
 - Exopod of uropod wider than long; telson reaching at least halfway along endopod 2
 - 2 Exopod of uropod apically notched; telson apically rounded; intertidal to sublittoral *L. diemenensis*
 - Exopod of uropod not apically notched; telson acute; bathyal . . . *L. kapala*
- Leptanthura diemenensis* (Haswell)**

Figures 1-3

Paranthura diemenensis Haswell, 1884: 1011, pl. 52, figs. 6-13, (misspelling in text; correct spelling is used in figure captions).

Leptanthura diemenensis. — Barnard, 1925: 151.

Leptanthura dienenensis (Haswell). — Nierstrasz, 1941: 242 (misspelling).

Description: Head a little wider than long, about $\frac{1}{2}$ as long as pereonite 1; rostrum broadly triangular, $\frac{1}{2}$ length of lateral lobes; eyes absent. Pereonite lengths as follows: 1 = 2 = 3 < 4 = 5 = 6 > 7. Pereon with obsolete dorsolateral grooves, obsolete dorsal pits on pereonites 4-6. Pleon about as long as pereonite 7, pleonites distinct.

Antenna 1 flagellum of 3-4 articles, first the longest, shorter than last two articles of peduncle. Antenna 2 flagellum rudimentary, of 4-5 short setose articles.

Mandible with an acute incisor, palp not reaching to end of incisor; palp article 2 three times length of first, bearing 1 (up to 3 on large specimens) setae distally; palp article 3 small with 2 stout, barbed spines terminally. Maxilla a slender serrated spine. Maxilliped basis not distinct from head, bearing 2 (up to 4) ventral setae distally; maxillipedal palp of 3 articles (but not clearly distinct), article 1 about $\frac{1}{3}$ length of basis, bearing 1 dorsal and 2-3 ventral setae distally, articles 2 and 3 minute, together with 4-7 setae.

Pereopod 1 stout; palm axial and with a broadly-based thumb proximally. Article 5 of pereopod 1 with 2-3 spines; palm of article 6 with 7-9 spines laterally, a simple stout seta after the second spine, and 9-10 simple setae mesially. Pereopods 2, 3 similar to first but less stout, more elongate and palms with smaller spines. Pereopods 4-7 progressively a little more elongate; article 5 small, triangular and bearing 2-3 spines; article 6 with setae and 3-4 spines posteriorly; dactyl about as long as palm of article 6.

Uropodal endopod triangular, setose, about $\frac{2}{3}$ length of peduncle; exopod divided by a deep notch into an acute ventral lobe and a larger, erect dorsal lobe with setose margins. Telson little shorter than uropod, dorsally concave, its lateral margins curved to an evenly rounded apex; statocyst opening by a proximal pore; 2 long erect setae and several smaller setae dorsally, 2 small setae at apex, sometimes in a minute notch.

Male: Differs from description given above in more elongate form; multi-articulate, setose flagellum of antenna 1 with about 20 articles reaching back to end of pereonite 1; more elongate pereopods; palm of pereopods with more simple setae laterally and highly setose mesially; appendix masculinis with a tapering flagellum extending beyond the inner ramus of pleopod 2.

In sub-males the multi-articulate flagellum of antenna 1 lacks setae and the appendix masculinis is missing or lacks its flagellum.

Material examined: 19 males, 71 females, 531 juveniles; 5-20 mm.

Holotype: AM P3317, juvenile, 13.1 mm.

Type locality: TASMANIA, Hobart, 'between tide marks'.

Other material:

QUEENSLAND. Middle Banks, Moreton Bay, QUBS stn 5, December 1972 (1 specimen).

N.S.W. Burwood Beach, 3.5 km S. of Hunter R., 14 m, HDWBS samples: AM P24027 (1 specimen).

E. of Malabar, Sydney, 31-192 m, AMSBS stations: stn A1, AM P24350 (9); stn D2, AM P22791 (1); stn 2E, AM P22792 (4); stn 4E, AM P22793 (1); stn III, AM P22782 (6), AM P22783 (7); stn V, AM P22785 (3), AM P22786 (1); stn 31, AM P22788 (1); stn 44, AM P22787 (5).

2 km E. of Long Bay, Sydney, 66 m, AMSBS stn IV, AM P22784 (3).

E. of North Head, Sydney, 20 m, AMSBS samples collected in association with the sponge *Polymastea craticia*: AM P22813 (1), AM P24362 (1). AMSBS station 22, AM P22789 (1).

Near Kurnell, Botany Bay, AM P8965 (1).

Near Sow and Pigs Reef, Port Jackson, AM P8969 (2).

VICTORIA. Port Phillip Bay, 5-22 m, NMV J475, PPBES stations: stn 906 (3 specimens); stn 907 (11); stn 913 (32); stn 918 (29); stn 921 (1); stn 922 (7); stn 925 (1); stn 927 (2); stn 928 (3); stn 932 (2); stn 945 (4); stn 954 (2); stn 955 (1); stn 959 (2); stn 961 (1); stn 968 (1); stn 977 (1); stn 978 (1); stn 983 (1); stn 984 (67); stn 985 (10); stn 1224 (2); stn 1226 (1).

Western Port, 2-19 m, 1964 CPBS stations, NMV J476: stn A1 (3); stn A4 (2); stn B2 (4); stn B3 (4); stn B4 (1); stn C1 (3); stn C2 (1); stn C4 (2).

1965 CPBS stations, NMV J477: stn 01S (21); stn 02N (1); stn 03S (3); stn 10E (2); stn 11N (49); stn 11S (24); stn 12N (1); stn 200 (8); stn 21N (10); stn 21S (10); stn 22N (6); stn 22S (16); stn 23N (6); stn 26N (1); stn 26S (6); stn 300 (8); stn 31N (6); stn 31S (6); stn 31E (1); stn 32N (15); stn 32S (1); stn 33N (14); stn 34N (4); stn 35N (1); stn 400 (1); stn 41N (4); stn 41S (5); stn 42S (2); stn 51N (21); stn 51S (9); stn 52N

(7); stn 600 (13); stn 61N (6).

1966-70 CPBS stations, NMV J478: stn 300 (4); stn 31N (17); stn 31S (12); stn 32N (34); stn 32S (13).

Distribution: Southern Queensland, New South Wales, Victoria and Tasmania; intertidal region to 192 m, on fine to coarse sandy sediments, often with shell. Specimens from N.S.W. were taken in association with the sponge *Polymastrea crasficia*.

Remarks: *Leptanthura diemenensis* is the most common paranthurid in benthic collections from the south-eastern Australian coast. It is most easily distinguished by the notched exopod on the uropod and the broad, rounded, dished telson. Specimens may be confused with *Bullowanthura pambula* with which it occurs.

L. diemenensis is most closely related to *L. laevigata* (Stimpson) from South Africa (Barnard, 1925) the only other species reported to have an apical notch in the uropodal exopod. The species differ in the form of pereopods 1.

Leptanthura nunana sp. nov.

Figures 4, 5

Description: Head as wide as long, about $\frac{1}{2}$ length of pereonite 1; rostrum triangular, almost as long as lateral lobes; eyes absent. Pereonite lengths as follows: $1 = 2 = 3 < 4 = 5 = 6 > 7$. Pereon with obsolete dorsolateral grooves, obsolete dorsal pits on pereonites 4-6. Pleon almost twice as long as pereonite 7, pleonites distinct.

Antenna 1 flagellum of 4 articles, first article very short and surrounding second laterally, flagellum shorter than last article of peduncle. Antenna 2 flagellum rudimentary, of 5-7 short, setose articles, as long as elongate last article of peduncle.

Mandible with an acute incisor, palp not reaching to end of incisor; palp article 2 three times length of first, without setae; palp article 3 small with 2 stout, barbed spines terminally. Maxilla a slender, serrated spine. Maxilliped basis not distinct from head, bearing 1 ventral seta distally; maxillipedal palp of 3 almost-fused articles, article 1 about $\frac{1}{4}$

length of basis, bearing 1 dorsal and 2 ventral setae distally, articles 2 and 3 minute, together with 5 setae.

Pereopod 1 stout; palm oblique and with a triangular thumb proximally. Article 5 of pereopod 1 with 1 spine; article 6 with 12-14 spines laterally, a simple stout seta after the third spine, and simple setae mesially. Pereopods 2, 3 similar to first but much less stout, more elongate and palms with smaller and fewer spines. Pereopods 4-7 subequal; article 5 small and triangular, bearing 1 spine; article 6 with 3-4 spines posteriorly; dactyl a little shorter than palm of article 6.

Uropodal endopod elongate, extending well beyond telson, setose, about $\frac{2}{3}$ length of peduncle; exopod lanceolate and with an acute apex, with setose margins. Telson little longer than uropod peduncle, dorsally convex, lateral margins parallel and apex evenly rounded; statocyst opening to a proximal dorsal pore; several setae dorsally and apically.

Male: Differs from description given above in more elongate form; multi-articulate, setose flagellum of antenna 1 with about 9 articles reaching back little beyond end of head; more elongate pereopods; palm of pereopod 1 setose mesially; appendix masculinis with a curved end extending well beyond the outer ramus of pleopod 2.

Material examined: 1 male, 1 female, 7 juveniles; 6-10 mm.

Holotype: NMV J479, juvenile, 9.7 mm.

Type locality: VICTORIA, Altona Bay, Port Phillip Bay, PPBES stn 901, sandy sediment, 8 m, 7 June 1971.

Paratypes:

VICTORIA. Port Phillip Bay, PPBES stations: stn 933, AM P25373, 25374 (2 specimens); stn 954, NMV J480, 481 (2); stn 955, NMV J482 (1); stn 983, NMV J483 (1).

Other material:

VICTORIA. Port Phillip Bay, PPBES stations: stn 914, NMV J484 (1 specimen); stn 934, NMV J485 (1).

Distribution: Port Phillip Bay, Victoria, clayey-sand to sandy sediments, 8-22 m.

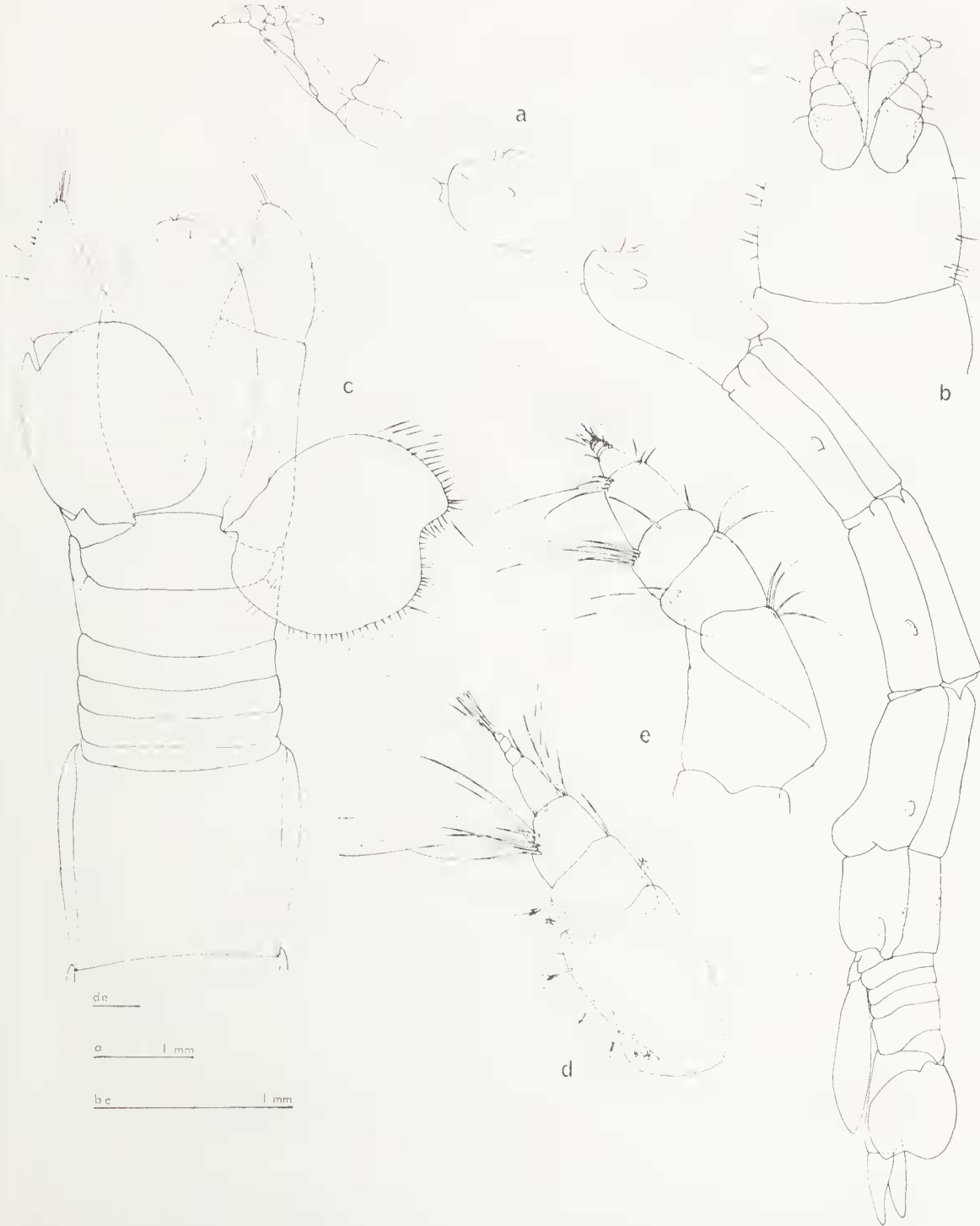


Figure 1—*Leptanthura diemenensis*. Female (NMV J 475, PPBES stn 983): a, lateral (limbs omitted); b, head; c, pereonite 6, pleon and tail fan; d, e, antennae 1, 2.

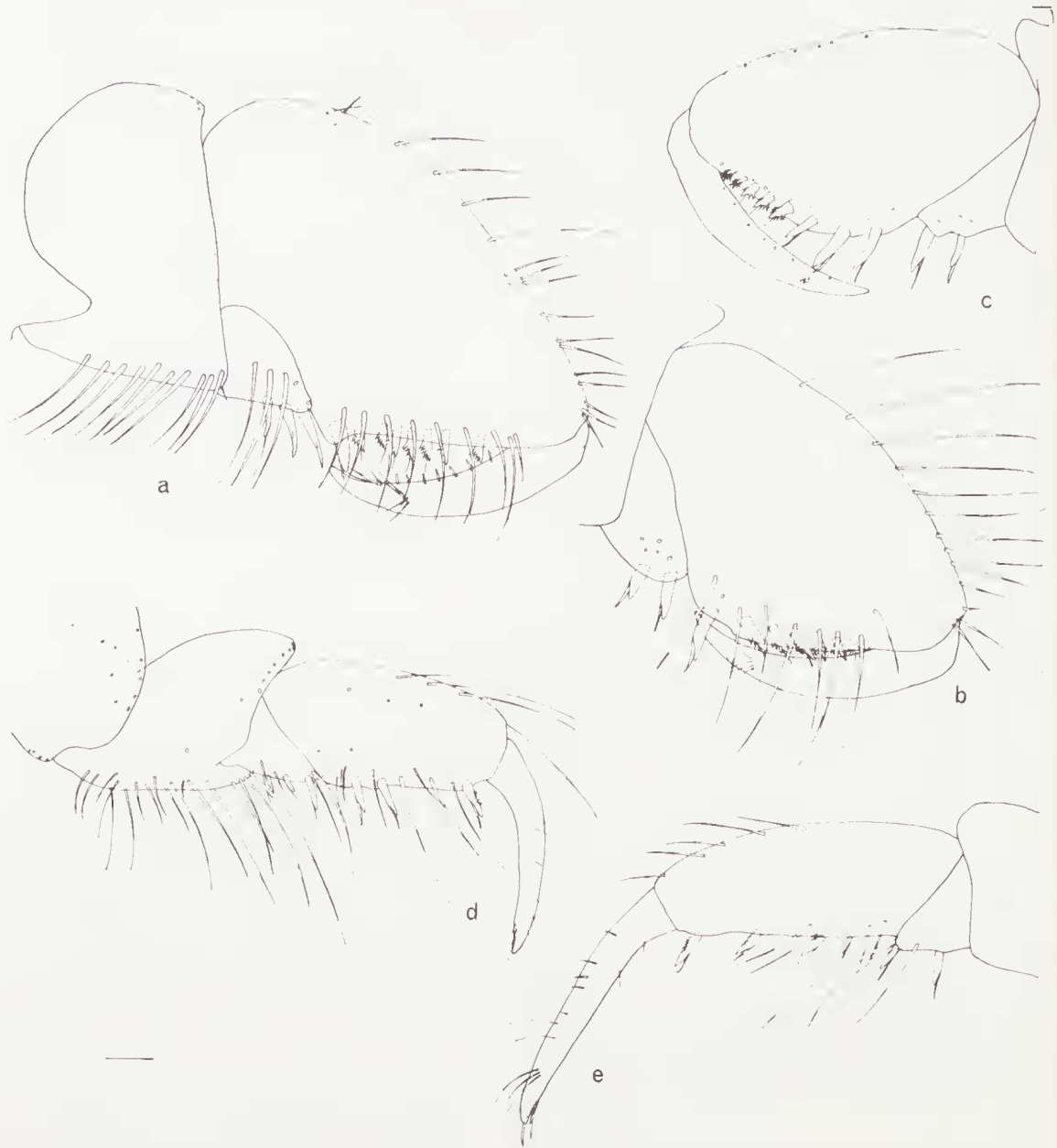


Figure 2—*Leptanthura diemenensis*. Female (NMV J475, PPBES stn 983): a-d, e, pereopods 1-4, 7.

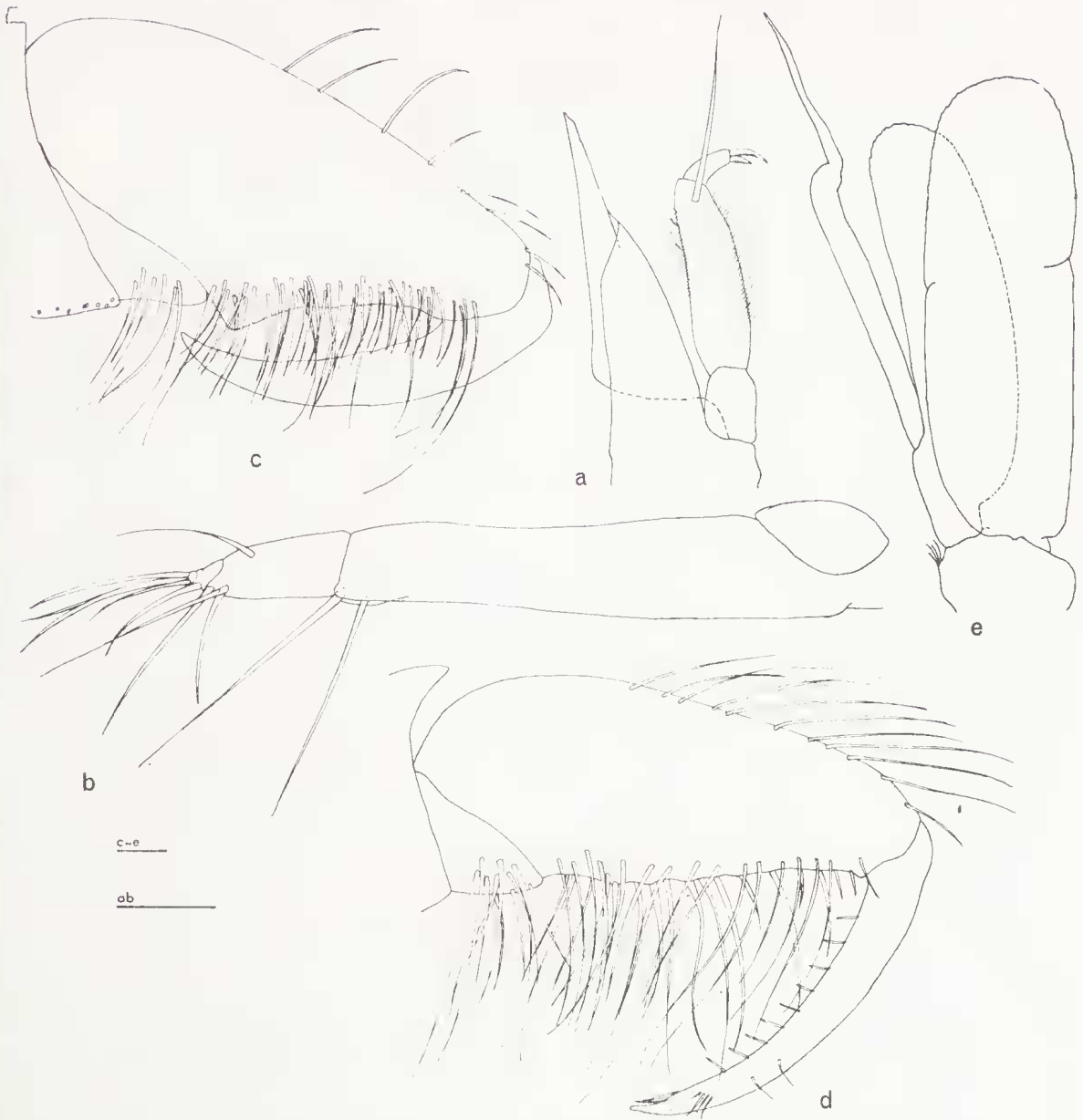


Figure 3—*Leptanthura diemenensis*. Female (NMV J475, PPBES stn 983): a, mandible; b, maxilliped. Male (NMV J475, PPBES stn 961): c, d, pereopods 1, 2 (mesial views); e, pleopod 2.

Remarks: *Leptanthura nunana* is distinguished by the long narrow uropodal endopods and the lanceolate exopods. The latter character is shared with *L. agulhasensis* Kensley from South Africa but the two species differ in the

form of the telson and pereopods.

The Australian aboriginal word 'nunana' means 'little' and suggests the small size of this species.



Figure 4—*Leptanthura nunana*. Holotype (NMV J479): a, head; b, pleon and tail fan; c, flagellum of antenna 2; d, mandible; e, maxilliped.



Figure 5—*Leptanthura nunana*. Holotype (NMV J479): a-d, e, pereopods 1-4, 7. Male (NMV J480, PPBES stn 954): f, pleopod 2.

Leptanthura kapala sp. nov.

Figures 6, 7

Description: Head a little wider than long, about $\frac{2}{3}$ as long as pereonite 1; rostrum broadly triangular, $\frac{1}{2}$ length of lateral lobes; eyes absent. Pereonite lengths as follows: $1 = 2 = 3 < 4 = 5 = 6 > 7$. Pereon with obsolete dorso-lateral grooves, obsolete dorsal pits on pereonites 4-6. Pleon about as long as pereonite 7, pleonites distinct.

Antenna 1 flagellum of 3-4 articles, shorter than last two articles of peduncle. Antenna 2 flagellum rudimentary, of 3-4 short setose articles, about as long as last article of peduncle.

Mandible with an acute incisor, palp not reaching to end of incisor; palp article 2 almost 3 times as long as first, without setae; palp article 3 small and with 2 stout barbed spines terminally. Maxilla a slender, serrated spine. Maxilliped basis not distinct from head, bearing 1-2 ventral setae distally; maxillipedal palp of 3 articles (but not clearly distinct); article 1 about $\frac{1}{3}$ length of basis, bearing 1 dorsal and 2 ventral setae distally; articles 2 and 3 minute, together with 4 setae.

Pereopod 1 stout; palm oblique and with a broadly-based thumb proximally. Article 5 of pereopod 1 with 1 spine; palm of article 6 with 11-14 spines laterally, a simple stout seta after the third spine, and several simple setae mesially. Pereopod 2 smaller than first and without a thumb; pereopod 3 much smaller than first, without a thumb but the palm posteriorly lobed. Pereopods 4-7 progressively a little more elongate; article 5 small and triangular, bearing 1 posterior spine and setae; article 6 with 2-3 posterior spines; dactyl longer than palm of article 6.

Uropodal endopod triangular, setose, about $\frac{3}{4}$ length of peduncle; exopod oval, its dorsal lobe overlying the telson, with setose margins. Telson reaching halfway along endopod, dorsally flat, its lateral margins tapering to an acute apex; statocyst opening to a proximal dorsal pore; 2 long, erect setae dorsally.

Male: Differs from description given above in moderately short, setose flagellum of antenna 1 with 8 articles reaching back to end

of head; more elongate pereopods; palm of pereopod 1 with many setae mesially; appendix masculinis with a curved tip reaching to the end of the outer ramus of pleopod 2.

Material examined: 4 males, 4 females, 48 juveniles; 7-11 mm.

Holotype: AM P25375, juvenile, 9.8 mm.

Type locality: N.S.W., E. of Wollongong, 34° 27'S., 151° 27'E., F.R.V. 'Kapala' station K76-23-02, 1200 m, 13 December 1976.

Paratypes: N.S.W. Type locality. AM P25376 (12 specimens).

Other material: N.S.W. Type locality, AM P25055 (43 specimens).

Distribution: New South Wales, bathyal zone, 1200 m.

Remarks: *Leptanthura kapala* is the only anthuridean so far described from the bathyal zone around Australia's coast. The species is recognized by the acute telson and broad uropodal exopod. *L. agulhasensis* Kensley from South Africa and *L. tenuis* (Sars) from the North Atlantic share the acute telson but the uropods and pereopods of these species differ.

The species is named for the N.S.W. State Fisheries research vessel, F.R.V. 'Kapala', which collected these specimens and has made some of the first biological collections from deep waters in Australia.

Bullowanthura new genus

Diagnosis: Paranthuridae without eyes. Pereon with feeble dorso-lateral grooves, otherwise smooth; pereonites 4-6 with small dorsal pits. Pleonites distinct. Telson thin, concave dorsally, not indurated; a single statocyst opening by a dorsal pore proximally. Uropod with endopod barely exceeding telson, exopod broad and erect. Antenna 1 flagellum rudimentary, of 3-4 articles. Antenna 2 flagellum rudimentary, of 4-5 articles. Mandible with a palp of a single article bearing one terminal seta. Maxilliped elongate, articles 1 and 2 fused to head; endite obsolete; palp about $\frac{1}{3}$ length of basis, of 2 articles, the last minute. Pereopod 1 stout, subchelate, palm with a proximal thumb, oblique. Pereopods 2, 3 much less well developed than first, barely subchelate. Pereopods 4-7

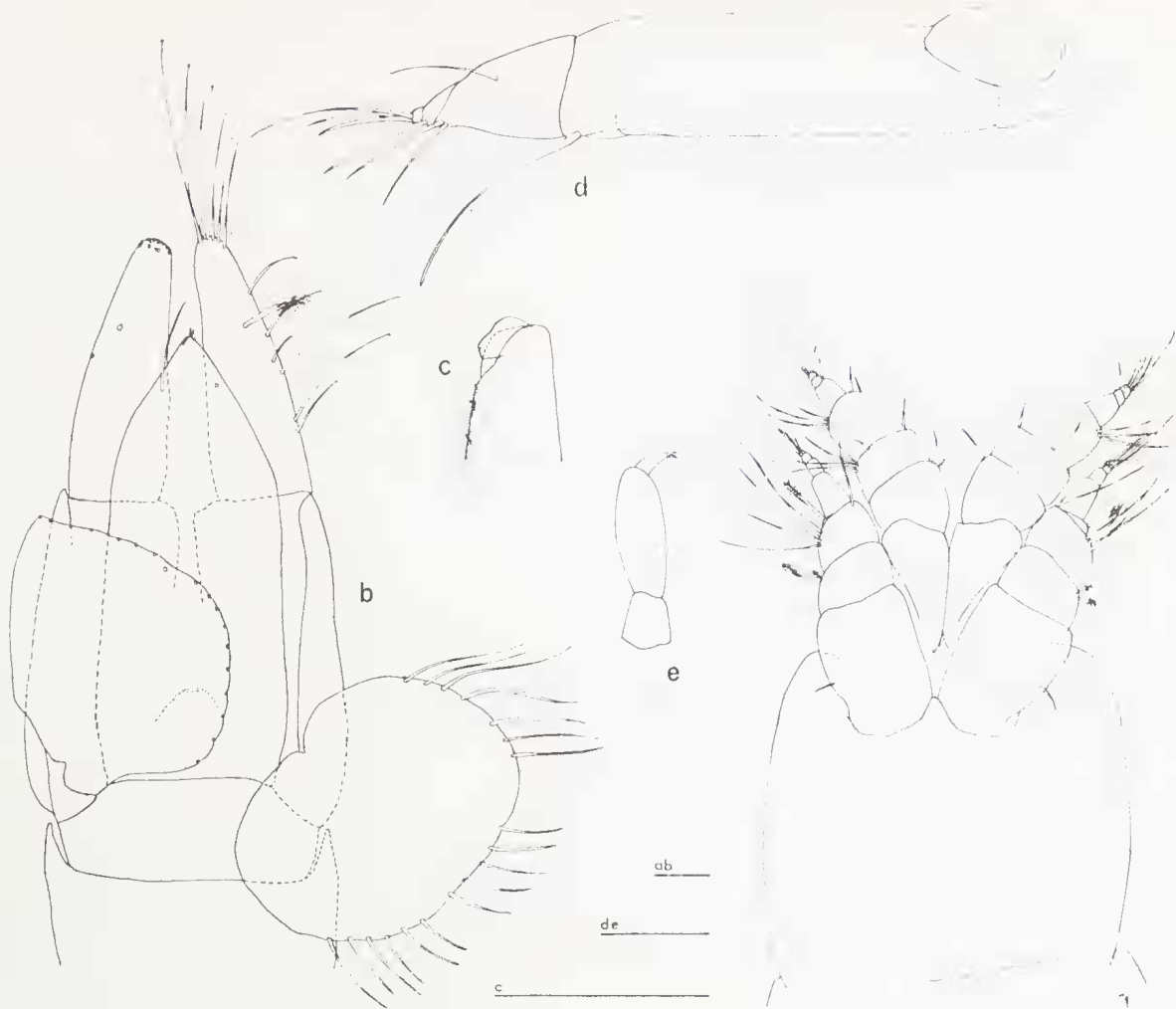


Figure 6—*Leptanthura kapala*. Holotype (AM P25375): a, head; b, tail fan; c, mandibular palp (terminal articles); d, maxilliped. Juvenile (AM P25376): e, mandibular palp.

with article 5 triangular and lacking a free anterior margin. Pleopod 1 operculiform, only moderately indurated. Adult male characterized by more elongate pereopods than juveniles or females and by a multi-articulate, setose flagellum on antenna 1. Females with oostegites on pereonites 2-5.

Type species: Bullowanthurus pambula new species.

Remarks: Bullowanthurus is close to *Leptanthura*, differing in having a mandibular palp

of a single article. *Leptanthura* possesses a 3-articulate palp of characteristic form. Both genera are blind, have distinct pleonites, have similar telson and uropods, similar antennae, maxillipeds and pereopods 4-7.

Barnard (1925) recognized the constant form of the mandibular palp in *Leptanthura* but noted variations in other genera. He did not find 'it always possible to use these differences as generic characters'. Nevertheless, three anthurid genera, *Pendantanthura*, *Ptilanthura* and *Xenanthura*, and three paranthurid genera, *Cruregens*, *Colanthura* and possibly *Cruranthura*, lack a mandibular palp so it seems the character may have some value. *Bullowanthurus* and the following new genus, *Ula-*



Figure 7—*Leptanthura kapala*. Holotype (AM P25375): a-d, e, pereopods 1-4, 7.

kanthura, are the only paranthurids with a palp of a single article.

Bullowanthura and *Ulakanthura* differ in the degree of development of pereopods 2 and 3. In *Bullowanthura* pereopods 2 and 3 are poorly developed and approach walking legs in form. In *Ulakanthura* these two limbs are larger than the first pereopod. Pereopods 4-7 are also different in the two genera.

The genus is monotypic.

The prefix 'bullowa' used in formation of the generic name is an Australian aboriginal word meaning 'flower' and reflects the mean-

ing of the root 'anthos' used in most generic names in the family.

***Bullowanthura pambula* sp. nov.**

Figures 8, 9

Description: Head as wide as long, about $\frac{1}{2}$ as long as pereonite 1; rostrum broadly triangular, $\frac{1}{2}$ length of lateral lobes; eyes absent. Pereonite lengths as follows: $1 = 2 = 3 < 4 = 5 = 6 > 7$. Pereon with obsolete dorso-lateral grooves, obsolete dorsal pits on pereonites 4-6. Pleon little longer than pereonite 7, pleonites distinct.

Antenna 1 flagellum of 3-4 articles, first the longest, little longer than last article of ped-

peduncle. Antenna 2 flagellum rudimentary, of 4-5 short setose articles.

Mandible with an acute incisor, palp a single narrow article with 1 terminal seta. Maxilla a slender, serrated spine bearing a minutely hooked keel on its distal inner margin. Maxilliped basis not distinct from head, bearing 2-3 ventral setae distally; maxillipedal palp of 2 articles, first about $\frac{1}{3}$ length of basis and bearing 1 dorsal seta and 4 ventral setae, second minute and with 3 terminal setae.

Pereopod 1 stout; palm oblique and with a strong proximal thumb. Article 5 of pereopod 1 with 2-4 spines; palm of article 6 with 7-13 spines laterally and in the same row a long simple seta near the base of the thumb and another after the last spine; palm with 8-12 simple setae mesially. Pereopods 2, 3 unlike the first, article 6 barely thickened, palms lacking a thumb and bearing 6 spines. Pereopods 4-7 subequal; article 5 small and triangular, bearing 2 spines; article 6 with 2-4 posterior spines; dactyl about as long as article 6.

Uropodal endopod elongate-triangular, setose, little shorter than peduncle; exopod divided into two parts by a very shallow terminal notch, a smaller ventral lobe with a rounded apex and a larger semicircular dorsal lobe. Telson reaching more than halfway along endopod, dorsally concave, lateral margins curved to a broadly rounded apex; statocyst opening to a proximal dorsal pore; 2 pairs of setae terminally and a few dorsally.

Male: Differs from the above description in multi-articulate, setose flagellum of antenna 1 with about 10-12 articles reaching back to end of head; more elongate pereopods; palm of pereopod 1 with a longer and narrower thumb, bearing 11-14 spines laterally and many setae mesially; appendix masculinis a simple rod extending well beyond the outer ramus of pleopod 2.

Material examined: 6 males, 3 females, 17 juveniles; 3-11 mm.

Holotype: AM P25378, juvenile, 10.3 mm.

Type locality: N.S.W., 1.6 km E. of Malabar, Sydney, AMSBS stn III, 33° 58'S., 151° 17'E., dredged from 66 m, 31 July 1973.

Paratypes:

N.S.W. E of Malabar, Sydney, 66-69 m, AMSBS stations: stn III, AM P25379 (6 specimens), AM P22814 (2), AM P25380 (3); stn V, AM P25382 (2); stn 4C, AM P22790 (1).

E. of Long Bay, Sydney, 66 m, AMSBS station IV, AM P25381 (3).

VICTORIA. Port Phillip Bay, 8-25 m, PPBES stations: stn 901, NMV J486-J488 (3); stn 906, NMV J489 (1); stn 969, NMV J554 (1); stn 982, NMV J555-J557 (3).

Distribution: New South Wales and Victoria, 8-69 m, on sandy sediments.

Remarks: The species has been previously confused with *Leptanthura diemenensis* with which it co-occurs. *Bullowanthura pambula* may be separated on its smaller size and more pronounced thumb on pereopod 1 and, more definitely, on the uni-articulate mandibular palp.

The series from Port Phillip Bay differed slightly from those off Sydney in features which could only be attributed to their slightly smaller size. In general, smaller specimens have fewer spines on the cutting edges of articles 6 of the pereopods, the number on pereopod 1, for example, showing quite a wide range.

The Australian aboriginal word 'pambula' means 'two waters' and indicates the distribution of the species.

Ulakanthura new genus

Diagnosis: Paranthuridae without eyes. Pereon with feeble dorsolateral grooves, otherwise smooth; pereonites 4-6 with small dorsal pits. Pleonites distinct. Telson thin, concave to moderately convex dorsally, not indurated; a single statocyst opening by a dorsal pore proximally. Uropod with endopod exceeding telson by about half its length, exopod usually broad and erect. Antenna 1 flagellum rudimentary, of 3-4 articles. Antenna 2 flagellum rudimentary, of 4-5 articles. Mandible with a palp of a single article without setae. Maxilliped elongate, articles 1 and 2 fused to head; endite obsolete; palp about one-third of length of basis, of 2 or 3 articles, the last minute. Pereopod 1 stout, subchelate, palm with a proximal thumb, oblique-transverse. Pereopods 2 and 3 stout, second at least more well de-



Figure 8—*Bullovanthura pambula*. Holotype (AM P25378): a, head; b, pleon and tail fan; c, mandible; d, maxilliped. Male (AM P25382, AMSBS stn V): e, pleopod 2.

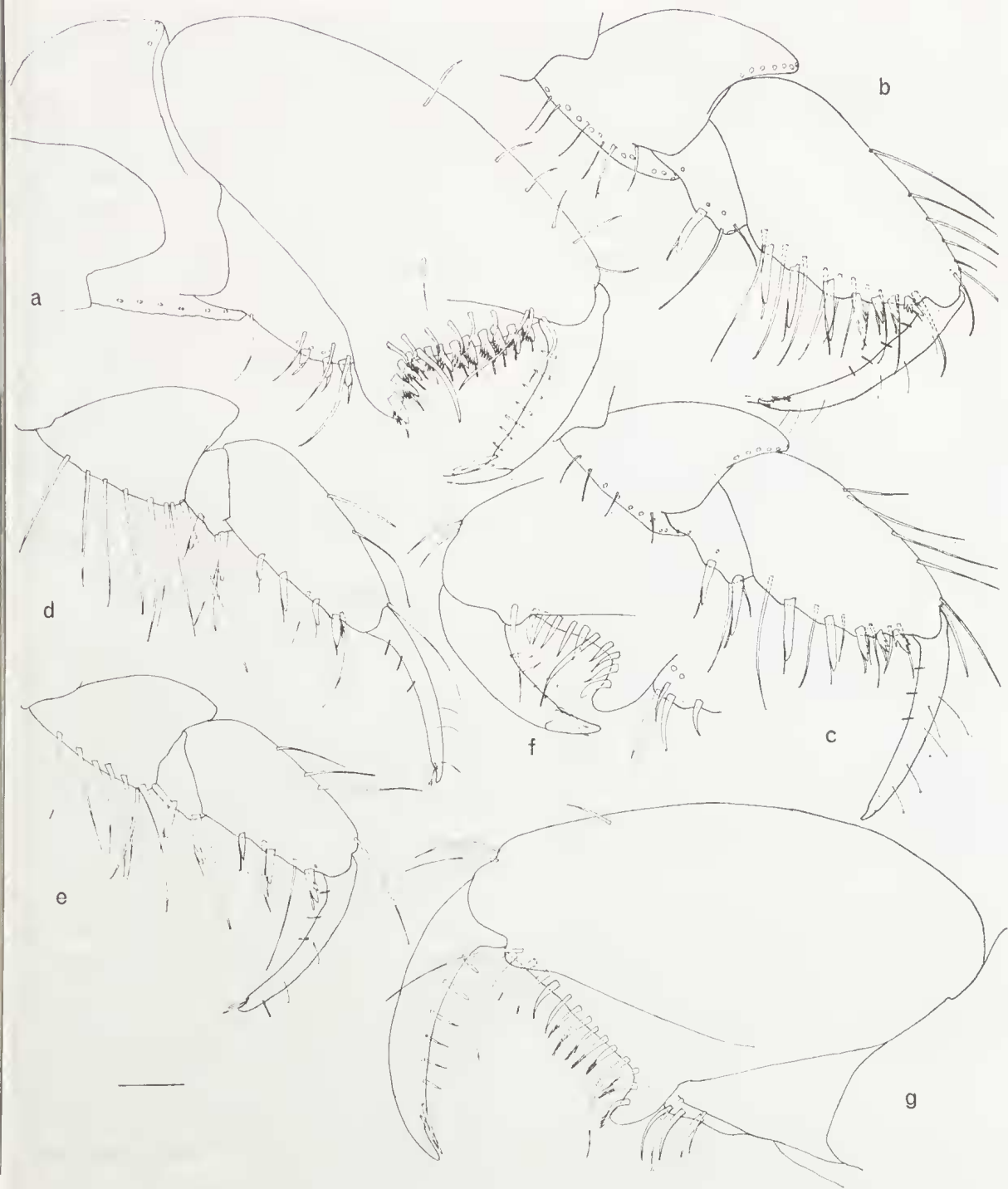


Figure 9—*Bullowanthura pambula*. Holotype (AM P25378): a-d, e, pereopods 1-4, 7. Male (NMV J486, PPBES stn 901): f, pereopod 1 (mesial setae omitted). Male (AM P25382, AMSBS stn V): g, pereopod 1 (mesial setae omitted).

veloped than first; articles 2 and 6 especially broad. Pereopods 4-7 with article 5 lobed posteriorly and extending along posterior margin of more distal articles; article 5 triangular and lacking a free anterior margin; articles 5 and 6 with strong posterior spines and article 7 with terminal articulating spines. Pleopod 1 operculiform, only moderately indurated. Adult male characterized by multi-articulate setose flagellum on antenna 1 and more elongate limbs. Females with oostegites on pereonites 2-5.

Type species: Paranthura crassicornis Haswell, 1881.

Remarks: *Ulakanthura* is very close to *Leptanthura* and the preceding new genus, *Bul-lowanthura*. All three genera are blind, have distinct pleonites and have similar telsons, uropods, antennae and maxillipeds. *Leptanthura* is distinguished by the 3-articulate mandibular palp of constant form. The other two genera share a mandibular palp of a single article, a feature found in few other anthurideans. The terminal seta on the palp of *B. pambula* is not found in species of *Ulakanthura* described here.

Ulakanthura is notable for the relative size of pereopods 1-3, the first being the smallest. This relationship is unknown in other paranthurids. The posterior lobe on article 4 and the terminal articulating spines which replace the unguis on article 7 of pereopods 4-7 are also not known in other paranthurid genera.

The genus is found only from eastern Australia where at present six species are known.

The prefix 'ulaka' used in formation of the generic name is an Australian aboriginal word meaning 'flower' and reflects the meaning of the root 'anthos' used in most generic names in the family.

KEY TO SPECIES OF *ULAKANTHURA*

- 1 Uropodal exopod apically cleft 2
- Uropodal exopod not apically cleft 4
- 2 Maxillipedal basis with many (>7) ventral and lateral setae *U. colac*
- Maxillipedal basis with few (<4) ventral and lateral setae 3

- 3 Telson broadest terminally, apical lobes squarish; article 4 of pereopod 4 with posterior lobe extending distally almost to end of article 6 . . . *U. cooma*
- Telson widest at midpoint, apical lobes rounded; article 4 of pereopod 4 with posterior lobe extending distally to end of article 5 *U. crassicornis*
- 4 Telson tapering to two acute terminal lobes; uropodal exopod lanceolate ($\frac{1}{2}$ as wide as long) *U. namoo*
- Telson ending in two broadly semicircular lobes; uropodal exopod ovate ($\frac{2}{3}$ as wide as long) 5
- 5 Telson widest at proximal one third; appendix masculinis of male shorter than outer ramus of pleopod 2 . . . *U. lara*
- Telson parallel-sided; appendix masculinis of male longer than outer ramus of pleopod 2 *U. wanda*

***Ulakanthura crassicornis* (Haswell)**

Figures 10, 11

Paranthura (?) *crassicornis* Haswell, 1881: 478, pl. 18, fig. 5.—Haswell, 1882: 305.
Leptanthura crassicornis.—Barnard, 1925: 151. Nierstrasz, 1941: 232 (part).
 not *Paranthura crassicornis*. — Haswell, 1884: 1011-2, pl. 53, figs. 8, 9 (= *Paranthura* sp.).
 not *Calathura*, sp. — Stebbing, 1905: 8 (from Sri Lanka).
 not *Leptanthura crassicornis* (Haswell). Nierstrasz, 1941: 242 (part from Sri Lanka).

Description: Head about as long as greatest width, tapering anteriorly, almost as long as pereonite 1; rostrum broadly triangular, about $\frac{1}{3}$ as long as lateral lobes; eyes absent. Pereonite lengths as follows 1 < 2 = 3 < 4 = 5 = 6 > 7. Pereon with dorsolateral grooves, dorsal pits and paired rows of setae on dorsum of pereonites 4-6. Pleon as long as pereonite 7, pleonites distinct.

Antenna 1 flagellum of 3-4 articles, shorter than last article of peduncle. Antenna 2 flagellum rudimentary, of 4 setose articles.

Mandible with an acute incisor, palp a single tapering article, not reaching to midpoint

of mandible. Maxilla a slender, serrated spine bearing a minutely-hooked keel on its distal inner margin. Maxilliped basis not distinct from head, bearing 1 ventral seta distally; maxillipedal palp of 2 barely-distinct articles, about $\frac{1}{3}$ length of basis and bearing 8 ventral-distal setae and 1 dorsal-proximal seta.

Pereopod 1 stout; palm oblique-transverse and with a broad square thumb proximally. Article 5 of pereopod 1 with 3-4 spines; article 6 with 12-15 spines laterally along the cutting edge and a stout seta in the same row after the fourth spine. Pereopods 2, 3 stouter than first, articles 2 and 6 broader than those of first. Article 5 of pereopods 2, 3 without spines; palm of article 6 with a blunt proximal thumb and a row of about 16 spines laterally. Pereopods 4-7 dissimilar to pereopods 1-3, subequal; article 4 of pereopods 4-7 setose, posteriorly lobed, the lobe not reaching end of article 5 on pereopod 4 and about $\frac{1}{3}$ way along article 5 on pereopod 7; article 5 triangular, bearing 3-4 strong posterior spines; article 6 with 4-5 strong posterior spines; article 7 proximally curved, not tapering, with 1 short and 1 long terminal spine.

Uropodal endopod triangular, setose, about $\frac{2}{3}$ as long as peduncle; exopod divided by a clear notch into a ventral lobe with an acute apex and a larger erect dorsal lobe, with setose margins. Telson widest at midpoint and reaching halfway along endopod, dorsally flat-concave, divided by a deep wide notch into two semi-circular lobes; statocyst opening to a dorsal pore at the base of the telson; two pairs of setae in the terminal notch.

Male: Differs from the above description in possessing an elongate, setose flagellum on antenna 1 with about 14 articles reach back to end of pereonite 1; axial setose palm of pereopod 1; longer dactyls on pereopods 4-7; appendix masculinis on pleopod 2. The only adult male is the 'holotype' which is not in good condition, the remaining males examined lacked setae on the antenna 1 flagellum.

Material examined: 5 males, 1 female, 5 juveniles; 10-13 mm.

Holotype: AM P3316, male, 12.5 mm.

L

Type locality: N.S.W., Port Jackson.

Other material:

N.S.W. Belmont Beach, 16 km S. of Hunter R., 22 m, HDWBS samples AM P24021-24025 (6 specimens).

Burwood Beach, 3.5 km S. of Hunter R., 22-28 m, HDWBS samples: AM P24028 (2), AM P24029 (1).

E. of Malabar, Sydney, 31 m, AMSBS stn A1: AM P25383 (1).

Distribution: Central New South Wales, 22-31 m, coarse sandy sediments.

Remarks: Three paranthurids are catalogued together in the Old Collection of the Australian Museum as P3316 under the name *Paranthura crassicornis*. I have deduced that one of these, a male, is the specimen described by Haswell in 1881 and its large setose antenna 1 suggested the specific name to Haswell. In 1884 Haswell ascribed two more specimens to *P. crassicornis* noting differences in the antennae. The two other specimens stored as P3316 are probably those referred to by Haswell in 1884 but are not the same species as the original.

Haswell (1881) remarked that pereopod 1 was larger than the following ones, a feature common in most anthurids. This is not so in *U. crassicornis* but is not obvious at first glance.

Ulakanthura crassicornis is one of three species in this genus in which the uropodal exopod is cleft. The others are *U. cooma* from which it differs in form of the pereopods and telson, and *U. colac* from which it differs in the same characters and in the number of setae on the maxilliped basis. *U. crassicornis* is sympatric only with *U. cooma*.

Stebbing (1905) suggested that two specimens collected in Ceylon (Sri Lanka) may belong to *Paranthura (?) crassicornis* Haswell. Nevertheless, he listed them under the name *Calathura*, sp. and remarked on their dark eyes. This character clearly excludes them from *Ulakanthura crassicornis*.

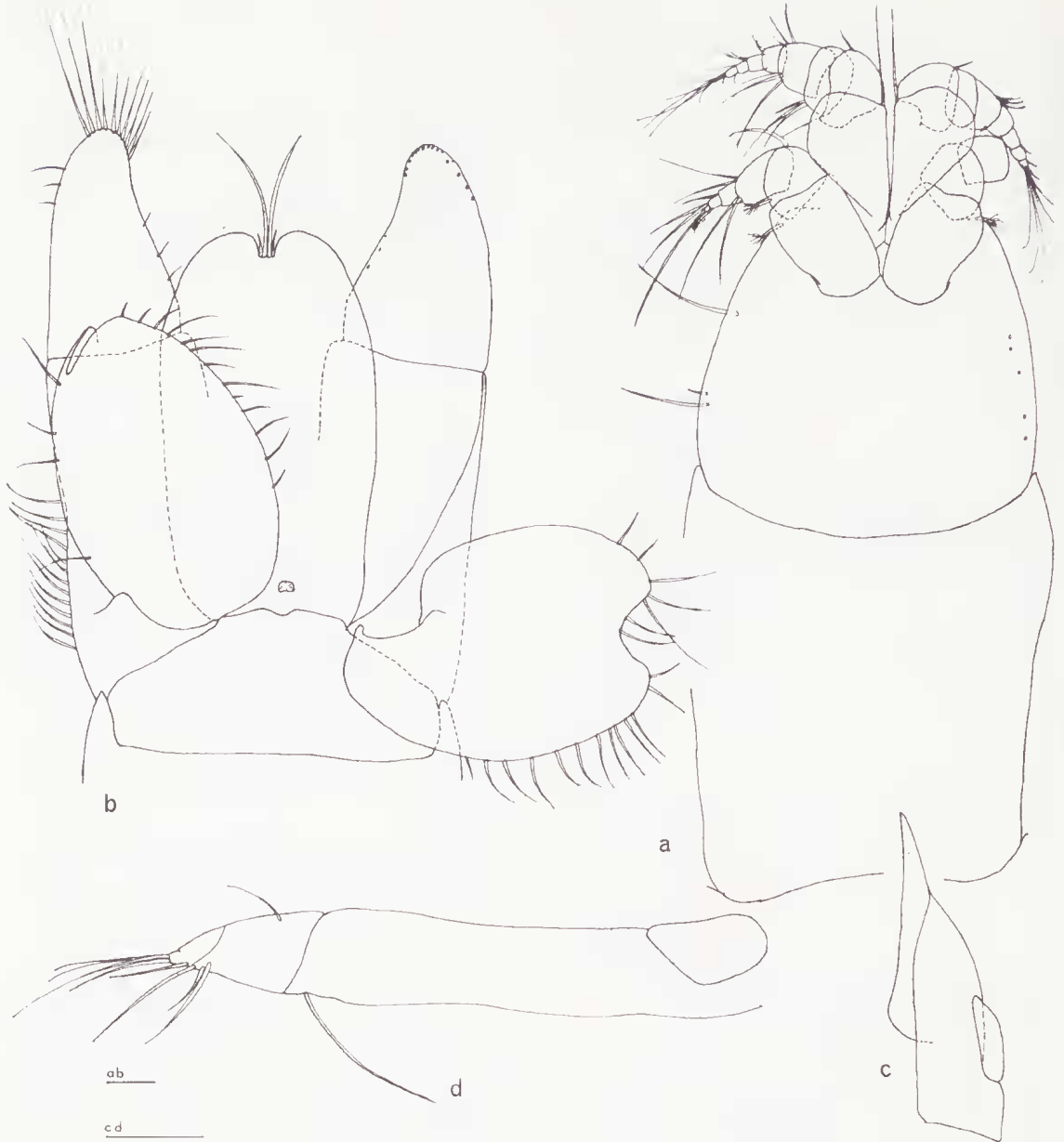


Figure 10—*Ulakanthura crassicornis*. Juvenile (AM P24021, HDWBS sample): a, head; b, tail fan; c, mandible; d, maxilliped.

***Ulakanthura colac* sp. nov.**

Figures 12, 13

Description: Head about as long as greatest width, tapering only anteriorly, about $\frac{3}{4}$ length

of pereonite 1; rostrum broadly triangular; eyes absent. Pereonite lengths as follows: $1 < 2 = 3 < 4 = 5 = 6 > 7$. Pereon with obsolete dorsolateral grooves, dorsal pits and paired rows of few setae on dorsum of pereonites 4-6. Pleon little shorter than pereonite 7, pleonites distinct.

Antenna 1 flagellum of 3-4 articles, little

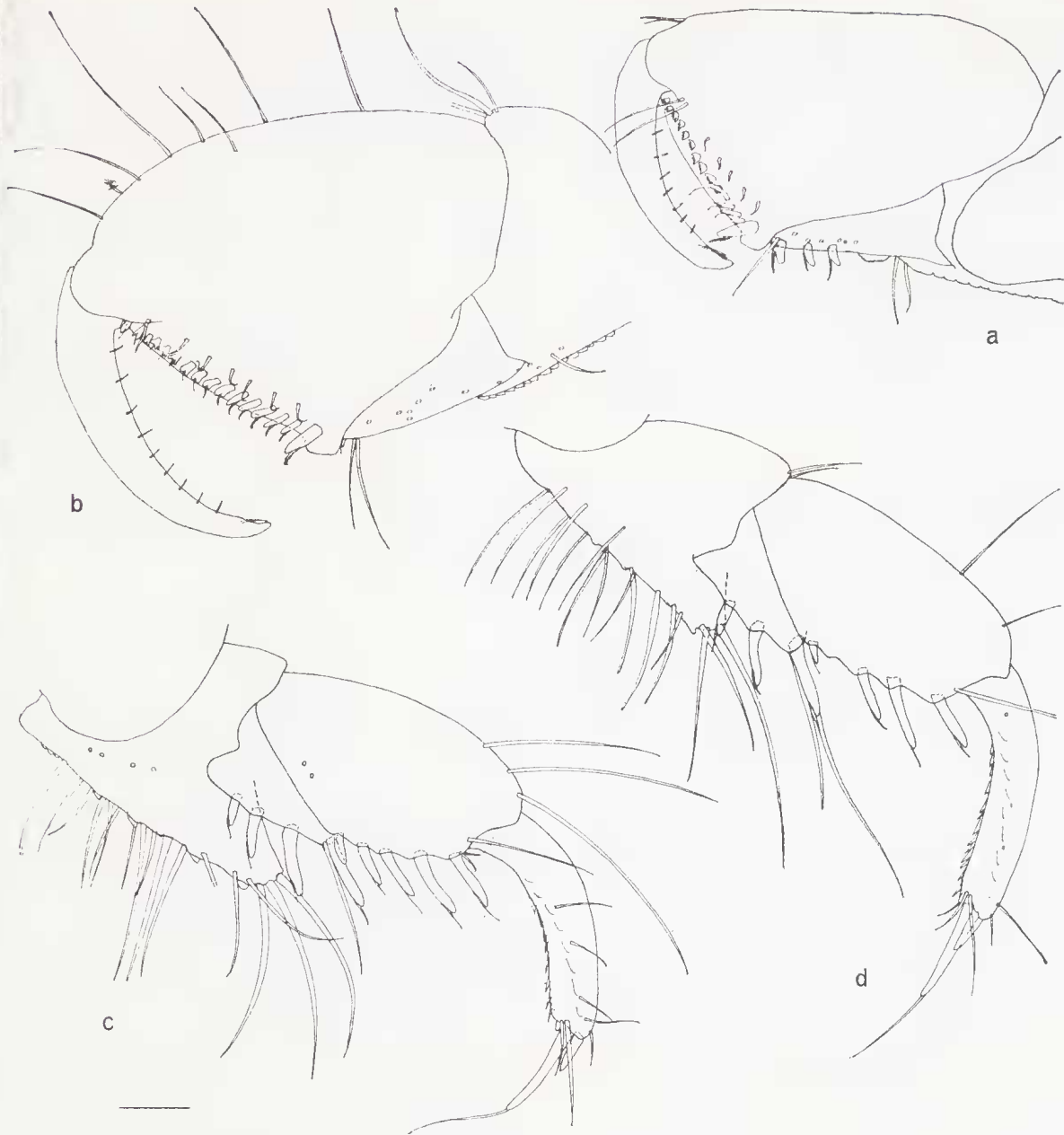


Figure 11—*Ulakanthura crassicornis*. Juvenile (AM P24021, HDWBS sample): a, b, c, d, pereopods 1, 2, 4, 7.

longer than last article of peduncle. Antenna 2 flagellum of 4-5 setose articles.

Mandible with an acute incisor, palp a single article, about $\frac{1}{3}$ length of incisor. Maxilla a slender, serrated spine bearing a minutely-hooked keel on its distal inner margin. Maxil-

liped basis not distinct from head, bearing 1 distal ventral seta and 7-14 setae laterally; maxillipedal palp with a distinct, minute, terminal article; palp articles together about $\frac{1}{3}$ length of basis and with 1 dorsal seta and 6 ventral-distal setae.

Pereopod 1 stout; palm axial-oblique and with a broad thumb proximally. Article 5 of pereopod 1 with 3-4 spines; article 6 with 7-10

spines laterally along cutting edge, a stout seta after the third or fourth and after the last spine. Pereopod 2 stouter than pereopod 1, article 2 especially broader than that of first, palm oblique. Article 5 of pereopods 2, 3 with 2-5 spines; palm of article 6 with a proximal thumb and row of 6-9 spines laterally. Pereopods 4-7 dissimilar to pereopods 1-3, subequal. Article 4 of pereopods 4-7 setose, lobed posteriorly, the lobe reaching only a little beyond the distal end of article 5 on pereopod 4 and not reaching this point on pereopod 7; article 5 triangular, with 3-6 strong posterior spines; article 6 with 4-8 stout posterior spines; article 7 barely tapering, with 1 long and 1 short terminal spine.

Uropodal endopod setose, triangular, about twice as long as wide, $\frac{2}{3}$ as long as peduncle; exopod broad and with a shallow apical notch, folded over telson. Telson reaching halfway along endopod, dorsally concave, more or less parallel-sided, tapering distally to two rounded-triangular lobes separated by a strong apical notch; statocyst opening by a small proximal dorsal pore; one pair of simple setae and one pair of 'brush-setae' in the terminal notch and setae on dorsal surface of the telson.

Male: Differs from the above description in more elongate palm on pereopod 1; setose flagellum of antenna 1 with 12 articles reaching back to middle of pereonite 1. Appendix masculinis a simple rod reaching to the end of the outer ramus of pleopod 2.

Material examined: 7 males, 3 females, 49 juveniles; 4-12 mm.

Holotype: QM W7400, juvenile, 7.8 mm.

Type locality: QUEENSLAND. Middle Banks, Moreton Bay, clean sand, 9-10 m, collected by S. Cook and S. Newlands for University of Queensland benthic studies, March 1973.

Paratypes:

QUEENSLAND: Middle Banks, Moreton Bay, QUBS samples: QM W7344 (4 specimens), QM W7345 (6), QM W7346 (1).

Other material:

N.S.W. Burwood Beach, 3.5 km S. of Hunter R., 14-22 m, HDWBS samples: AM P24026 (1 specimen), AM P25384 (1).

Botany Bay, SPCC stations: stn 18, AM P25360 (1); stn 65, AM P25366 (1); stn 83, AM P25367 (1); stn 85, AM P25368 (1).

VICTORIA: Port Phillip Bay, 5-10 m, PPBES stations: stn 960, NMV J490-494 (44); stn 967, NMV J495 (1).

Distribution: Southern Queensland, New South Wales and Victoria, well-sorted sandy sediments, 5-22 m.

Remarks: *Ulakanthura colac* is a widespread species found in all shallow water coastal surveys from eastern and southeastern Australia. The species is recognized by the combination of cleft uropodal exopod and setose maxilliped basis (see Remarks for *U. crassicornis* and *U. cooma*).

The epithet 'colac' is an aboriginal word for 'sand' and reflects the sandy habitat of this and other species in the genus.

Ulakanthura cooma sp. nov.

Figures 14, 15

Description: Head about as long as greatest width, tapering anteriorly, about $\frac{2}{3}$ as long as pereonite 1; rostrum broadly triangular; eyes absent. Pereonite lengths as follows: $1 < 2 = 3 < 4 = 5 = 6 > 7$. Pereon with dorso-lateral grooves, dorsal pits and paired rows of setae on dorsum of pereonites 4-6. Pleon little shorter than pereonite 7, pleonites distinct.

Antenna 1 flagellum of 4 articles, about as long as last article of peduncle. Antenna 2 flagellum of 4 setose articles.

Mandible with an acute incisor, palp a single article, about $\frac{1}{3}$ as long as incisor. Maxilla a slender, serrated spine bearing a minutely-hooked keel on its distal inner margin. Maxilliped basis not distinct from head, bearing 1 distal and 1-2 subdistal setae; maxillipedal palp with a barely-distinct second article and a distinct terminal article; palp articles together with 1 dorsal seta and 7 ventral-distal setae.

Pereopod 1 stout; palm axial and with a broad thumb proximally. Article 5 of pereopod 1 with 5 spines; article 6 with 10-11 spines laterally along cutting edge, a stout seta after the fourth or fifth spine and another after the last spine. Pereopods 2, 3 stouter than pereopod 1.

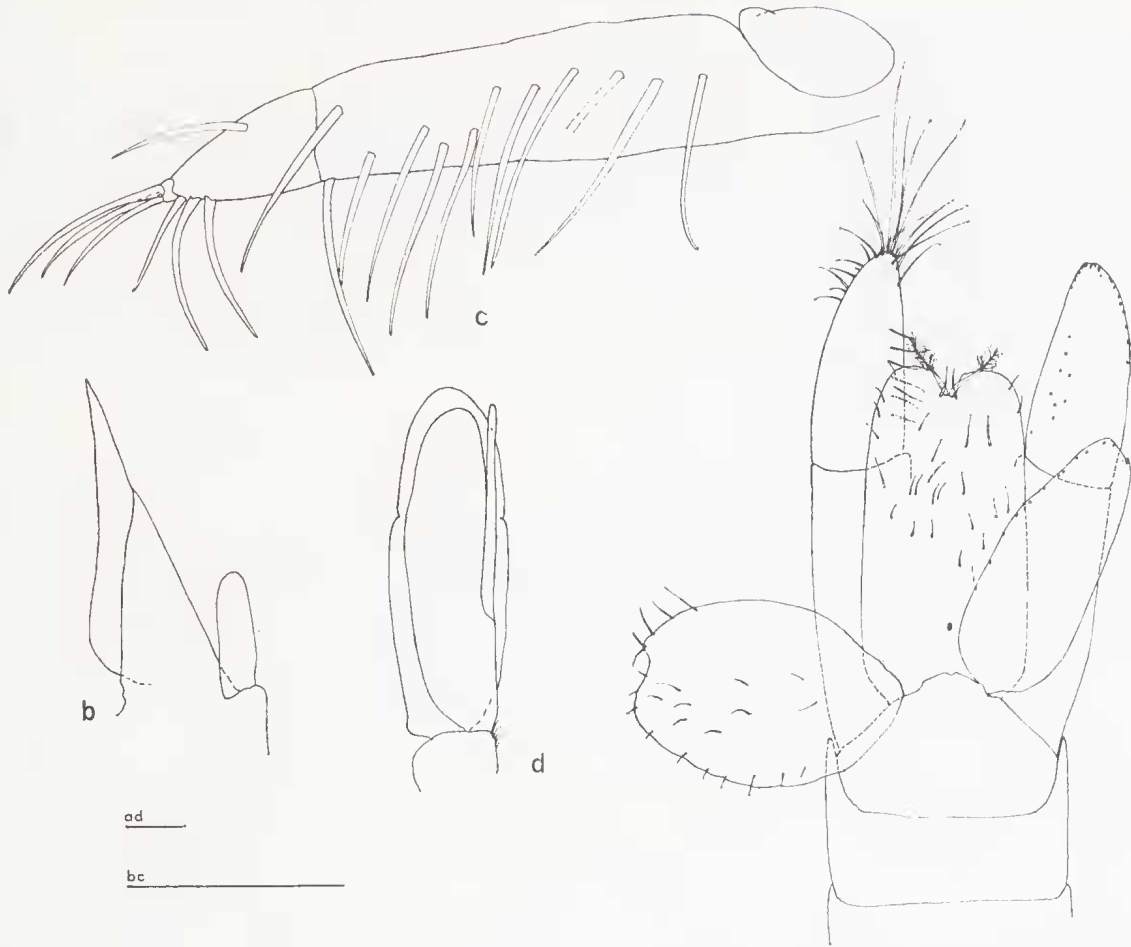


Figure 12—*Ulakanthura colac*. Holotype (QM W7400): a, tail fan; b, mandible; c, maxilliped. Male (QM W7344, QUBS sample): d, pleopod 2.

pod 1, articles 2 and 6 broader than those of first, palm oblique. Article 5 of pereopods 2, 3 with 1-3 spines; palm of article 6 with a proximal thumb and a row of 12-14 spines laterally. Pereopods 4-7 dissimilar to pereopods 1-3, subequal. Article 4 of pereopods 4-7 setose, strongly lobed posteriorly, the lobe reaching almost to the distal end of article 6 on pereopod 4 and halfway along article 6 on pereopod 7; article 5 triangular, with 6-8 strong posterior spines; article 6 with 8-10 stout posterior spines; article 7 barely tapering, with 1 long and 1 short terminal spine.

Uropodal endopod setose, linear-triangular, about 3 times as long as wide, almost as long as peduncle; exopod broad and apically notched, folded over telson. Telson reaching little beyond the end of the peduncle, dorsally concave, widest distally, two almost truncate terminal lobes separated by a strong apical notch; statocyst opening by a proximal dorsal pore; 1 pair of simple setae and 1 pair of 'brush-setae' in terminal notch, telson setose dorsally.

Male: Differs from above description in more elongate pleon; more elongate and more setose palm on pereopod 1; setose flagellum on antenna 1 with 12 articles reaching back to middle of pereonite 1. Appendix masculinis a simple rod exceeding the inner ramus of pleopod 2 by about $\frac{1}{4}$ its length.



Figure 13—*Ulakanthura colac*. Holotype (QM W7400): a-d, e, pereopods 1-4, 7.

Material examined: 5 males, 13 females, 60 juveniles; 7-18 mm.

Holotype: QM W7347, juvenile, 14.2 mm.

Type locality: QUEENSLAND. Middle Banks, Moreton Bay, clean sand, 9-10 m, collected by S. Cook and S. Newlands for the University of Queensland benthic studies, September 1973.

Paratypes:

QUEENSLAND. Middle Banks, Moreton Bay, QUBS samples: QM W6132 (14 specimens), QM W6133 (19).

Other material:

QUEENSLAND. Middle Banks, Moreton Bay, QUBS samples: QM W6125 (1 specimen), QM W6130 (9), QM W6131 (16), NMV J496 (4), AM P25385 (14).

Distribution: Southern Queensland, clean sand, 9-10 m.

Remarks: *Ulakanthura cooma* is a species of restricted distribution distinguished from others in the genus with a cleft uropodal exopod by the splayed, almost truncate telson and the particularly long lobes on articles 4 of pereopods 4-7.

The aboriginal word 'cooma' means a 'sand bank' and indicates the environment from which this species has been taken.

Ulakanthura lara sp. nov.

Figures 16-18

Description: Head about as long as greatest width, strongly tapering anteriorly, about $\frac{3}{4}$ length of pereonite 1; rostrum broadly triangular, about $\frac{1}{4}$ length of lateral lobes; eyes absent. Pereonite lengths as follows: $1 < 2 = 3 < 4 = 5 = 6 > 7$. Pereon with dorsolateral grooves, dorsal pits and paired rows of setae on dorsum of pereonites 4-6. Pleon as long as pereonite 7, pleonites distinct.

Antenna 1 flagellum of 4 articles, about as long as last article of peduncle. Antenna 2 flagellum of 4 setose articles.

Mandible with an acute incisor, palp a single article about $\frac{1}{2}$ as long as incisor. Maxilla a slender, serrated spine bearing a minutely-hooked keel on its distal inner margin. Maxilliped basis not distinct from head, bearing 6-14 lateral setae (most on larger specimens), 2 ventral setae and 1 dorsal seta distally; maxillipedal palp with a barely-distinct second article, palp about $\frac{1}{4}$ length of basis, bearing 7 ventral-distal setae and 1 dorsal seta.

Pereopod 1 stout; palm axial-oblique and with a short, broad thumb proximally. Article 5 of pereopod 1 with 4 ventral spines; article 6 with 10 spines laterally along the cutting edge, a stout seta after the fourth spine and another after the last spine. Pereopods 2, 3 stouter than pereopod 1, articles 2 and 6 broader than those of pereopod 1, palm oblique. Article 5 of pereopods 2, 3 with 1 posterior spine; palm of article 6 with a squarish proximal thumb and a row of about 13 spines laterally. Pereopods 4-7 dissimilar to pereopods 1-3, subequal;

posterior spines; article 6 with 6 stout posterior spines; article 7 proximally curved, not tapering, with 1 short and 1 long terminal spine.

Uropodal endopod triangular, setose, about $\frac{2}{3}$ length of peduncle; exopod broadly lanceolate, without an apical notch. Telson reaching halfway along endopod, dorsally flat-concave, broadest at proximal third and tapering to two short, rounded lobes separated by an apical notch; statocyst opening to a dorsal pore at the base of the telson; 1 pair of simple setae and 1 pair of 'brush-setae' in the terminal notch and many setae dorsally on the telson.

Male: Differs from the above description in more elongate pleon; more setose palm of pereopod 1; setose flagellum of antenna 1 with 8 articles reaching back to end of head. Appendix masculinis a simple rod reaching almost to end of outer ramus of pleopod 2.

Material examined: 5 males, 22 females, 91 juveniles; 8-16 mm.

Holotype: NMV J497, juvenile, 16.0 mm.

Type locality: VICTORIA. 3.5 km NE of Point King, South Channel, Port Phillip Bay, PPBES stn 980, sandy sediment, 31 m, 12 October 1971.

Paratypes:

VICTORIA: Port Phillip Bay, 2-31 m, PPBES stations: stn 967, NMV J498 (3 specimens); stn 973, AM P25386 (2); stn 974, NMV J499, J500 (4); stn 975, AM P25387 (1); stn 980, AM P25388 (1); stn 981, AM P25389 (6); stn 984, NMC J501-J503 (12); stn 986, NMV J504, J505 (10).

Western Port, 9-16 m, 1965 CPBS stations: stn 24N, NMV J447 (3); stn 31E, AM P25377 (1); stn 40E, NMV J448 (2).

Other material:

VICTORIA: Port Phillip Bay, 4-31 m, PPBES stations, NMV J508: stn 921 (5 specimens); stn 967 (7); stn 973 (10); stn 974 (4); stn 975 (4); stn 979 (2); stn 980 (1); stn 981 (9); stn 984 (4); stn 985 (1); stn 986 (9); stn 1244 (1); stn 1264 (1).

Western Port, 10-14 m, 1964 CPBS stations, NMV J509: stn A6 (2); stn B2 (1); stn B6 (4); stn C5 (1).



Figure 14—*Ulakanthura cooma*. Holotype (QM W7347): a, tail fan; b, c, d, e, pereopods 1, 2, 4, 7.

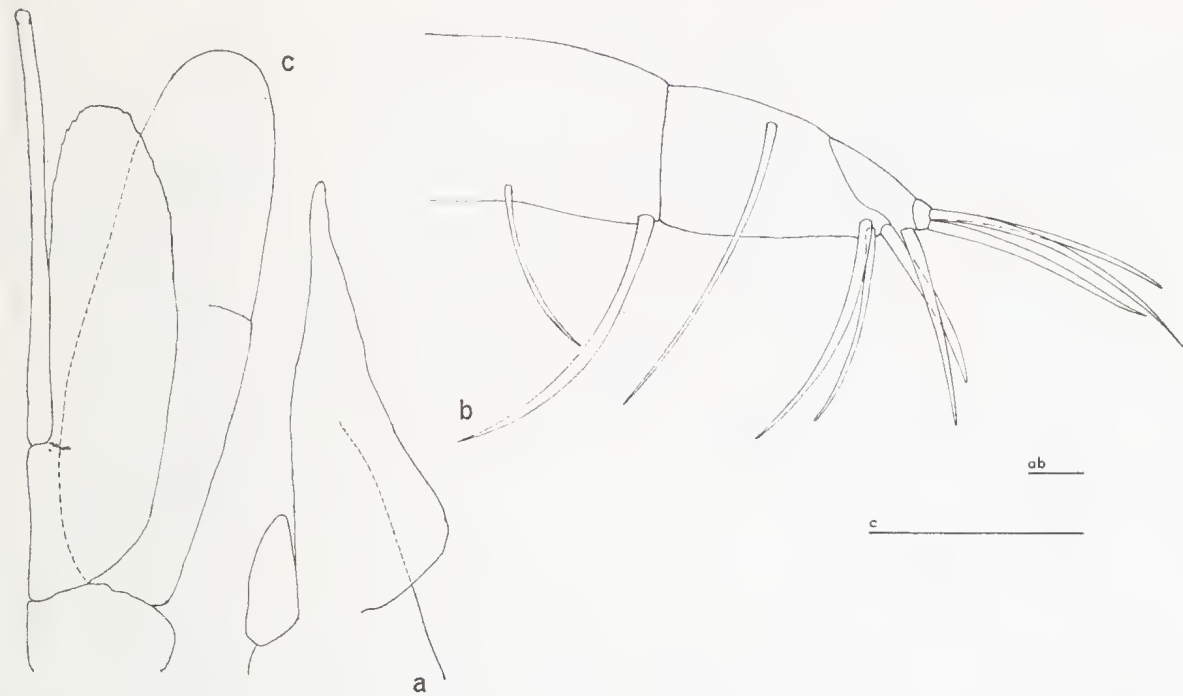


Figure 15—*Ulakanthura cooma*. Holotype (QM W7347): a, mandible; b, maxilliped. Male (QM W6135, MBBS sample): c, pleopod 2.

Ulakanthura namoo sp. nov.

Figures 19, 20

Description: Head a little longer than greatest width, tapering slightly anteriorly, about $\frac{3}{4}$ length of pereonite 1; rostrum triangular; eyes absent. Pereonite lengths as follows: $1 < 2 = 3 < 4 = 5 = 6 > 7$. Pereon with obsolete dorsolateral grooves, dorsal pits and paired rows of setae on dorsum of pereonites 4-6. Pleon about as long as pereonite 7, pleonites distinct.

Antenna 1 flagellum of 5 articles, about as long as last 3-4 articles of peduncle. Antenna 2 flagellum of 3 setose articles.

Mandible with an acute incisor, palp a single article about $\frac{1}{4}$ as long as incisor. Maxilla a slender, serrated spine bearing a minutely-hooked keel on its distal inner margin. Maxilliped basis fused on to head, bearing 2 ventral setae and 5-8 lateral setae; maxillipedal palp with a barely distinct terminal article; palp articles together with 1 dorsal seta and 7 ventral-distal setae.

Pereopod 1 stout; palm axial-oblique and with a broad thumb proximally. Article 5 of

article 4 setose, strongly lobed posteriorly, the lobe reaching to the distal corner of article 5 on pereopod 4 and not quite to this point on pereopod 7; article 5 triangular, bearing 5 stout setae. 1965 CPBS stations, NMV J510: stn 24S (1); stn 35N (1); stn 36N (1); stn 41N (1); stn 42N (1).

1966-70 CPBS station, NMV J511: stn 32N (1).

Distribution: Victoria, well-sorted coarse sandy sediments often with shell, 2-31 m.

Remarks: *Ulakanthura lara* is the only species dealt with in this paper endemic to Victoria. The species is very close to *U. wanda* from Moreton Bay but differs in the more oval form of the telson and the length of the appendix masculinis of the male.

The epithet 'lara' is an aboriginal place name from near Port Phillip Bay.

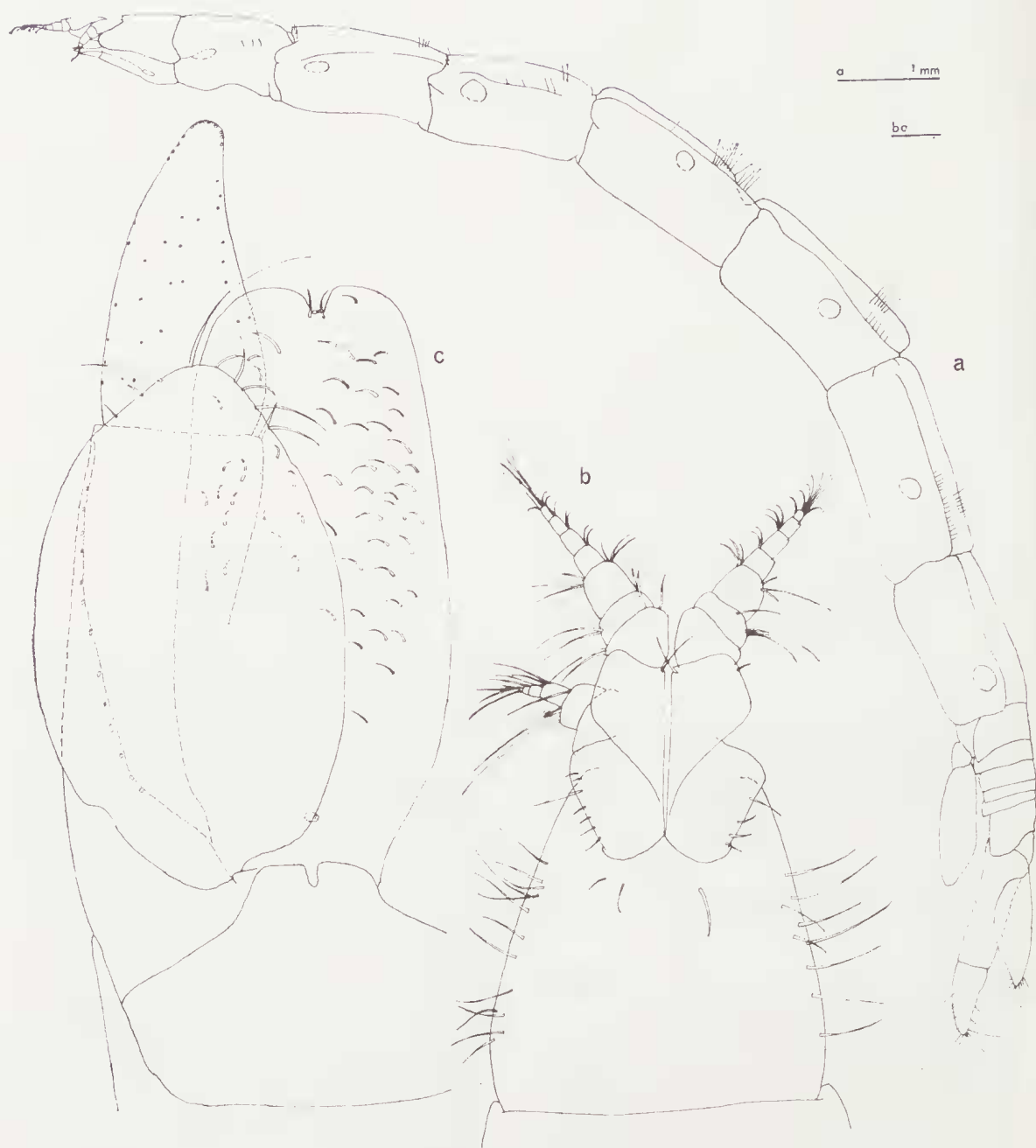


Figure 16—*Ulakanthura lara*. Holotype (NMV J497): a, lateral (limbs omitted); b, head; c, tail fan.

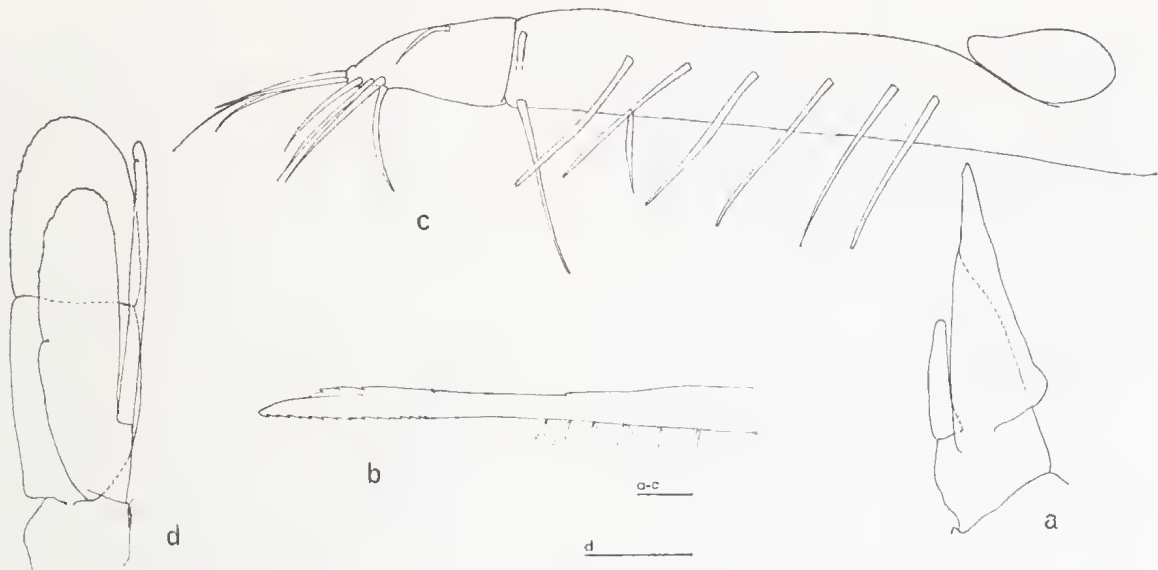


Figure 17—*Ulakanthura lara*. Holotype (NMV J497): a, mandible; b, maxilla; c, maxilliped. Male (NMV J449, PPBES stn 974): d, pleopod 2.

pereopod 1 with 3-5 spines; article 6 with 6-7 spines laterally along the cutting edge, a stout seta after the third or fourth spine and another after the last spine. Pereopods 2, 3 stouter than pereopod 1, article 2 particularly broader than that of pereopod 1, palm oblique. Article 5 of pereopods 2, 3 with 1 posterior spine; palm of article 6 with a proximal thumb and a row of 5-7 spines laterally. Pereopods 4-7 dissimilar to pereopods 1-3, subequal. Article 4 of pereopods 4-7 marginally setose, strongly lobed posteriorly, the lobe reaching distally midway along the posterior margin of article 6 on pereopod 4 and about $\frac{1}{3}$ along article 6 on pereopod 7; article 5 triangular and with 4-5 strong posterior spines; article 6 with 5-6 stout posterior spines; article 7 barely tapering, with 1 short and 1 long terminal spine.

Uropodal endopod setose, triangular, about twice as long as wide, about $\frac{2}{3}$ as long as peduncle; exopod lanceolate, $\frac{1}{2}$ as wide as long, not apically notched, folded over telson. Telson reaching halfway along endopod, dorsally convex, slightly tapering proximally but tip narrowing strongly to two acute lobes separated by a strong apical notch; statocyst opening

by a proximal dorsal pore; 1 pair of simple setae and 1 pair of 'brush-setae' in the terminal notch and several setae dorsally on the telson.

Male: Differs from the above description in slightly more elongate pleon; more setose and elongate palm on pereopod 1; setose flagellum on antenna 1 with 12 articles reaching back just beyond the posterior margin of the head. Appendix masculinis a simple rod just exceeding the inner ramus of pleopod 2.

Material examined: 17 males, 16 females, 103 juveniles; 7-10 mm.

Holotype: QM W7348, juvenile, 9.6 mm.

Type locality: QUEENSLAND. Middle Banks, Moreton Bay, clean sand, 9-10 m, collected by S. Cook and S. Newlands for the University of Queensland benthic studies, June 1973.

Paratypes:

QUEENSLAND: Middle Banks, Moreton Bay, 9-10 m, QUBS samples: QM W6138 (19 specimens), QM W6140 (20).

Other material:

QUEENSLAND: Middle Banks, Moreton Bay, 9-10 m, QUBS samples: QM W6136 (14 specimens), QM W6137 (8), QM W6141 (16), QM W6143 (22), NMV J512 (17), AM P25457 (7).

N.S.W.: Burwood Beach, 3.5 km S. of Hunter

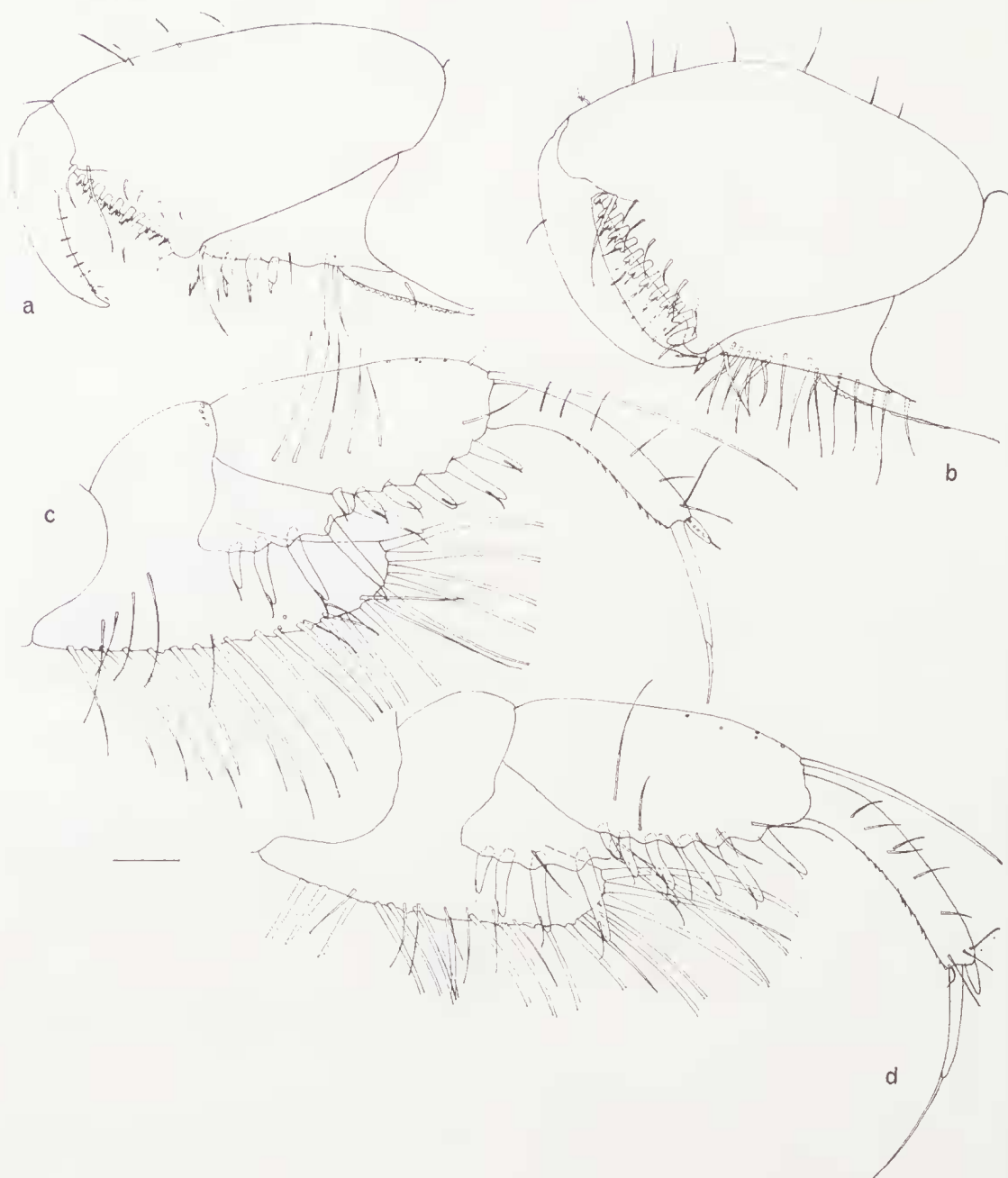


Figure 18—*Ulakanthura lara*. Holotype (NMVJ497): a, b, c, d, pereopods 1, 2, 4, 7.

R., 14-16 m, HDWBS samples: AM P24030-24032 (3 specimens).

Dudley Beach, 4.8 km S. of Hunter R., 10 m, HDWBS sample: AM P24039 (1).

Belmont Beach, 16 km S. of Hunter R., 12-23 m, HDWBS samples: AM P24033-24038 (8).

Distribution: Southern Queensland to central New South Wales; clean coarse sand; 9-23 m.

Remarks: *Ulakanthura namoo* is a clearly distinguished species recognized by its lanceolate uropodal exopod and by the narrow acute apical lobes on the telson. *U. wanda* and *U. lara* share with *U. namoo* a non-cleft exopod and also have a setose maxilliped basis but differ in the broader exopod and form of the telson.

The aboriginal word 'namoo' means 'sand' and indicates the environment from which this species is taken.

Ulakanthura wanda sp. nov.

Figures 21, 22

Description: Head little longer than greatest width, tapering anteriorly, about as long as pereonite 1; rostrum broadly triangular; eyes absent. Pereonite lengths as follows: $1 < 2 = 3 = 4 < 5 = 6 > 7$. Pereon with dorso-lateral grooves, dorsal pits and paired rows of setae on dorsum of pereonites 4-6. Pleon about as long as pereonite 7, pleonites distinct.

Antenna 1 flagellum of 3-4 articles, little longer than last article of peduncle. Antenna 2 flagellum of 4 setose articles.

Mandible with an acute incisor, palp a single article, almost $\frac{1}{2}$ as long as incisor. Maxilla a slender, serrated spine bearing a minutely-hooked keel on its distal inner margin. Maxilliped basis not distinct from head, bearing 2 ventral and 8-10 lateral setae; maxillipedal palp with a barely-distinct terminal article; palp articles together with 1 dorsal seta, 1 lateral seta and 7 ventral-distal setae.

Pereopod 1 stout; palm axial and with a broad thumb proximally. Article 5 of pereopod 1 with 4-5 spines; article 6 with 10-11 spines laterally along the cutting edge, a stout seta after the fourth spine and another after the last spine. Pereopods 2, 3 stouter than pereopod

1, articles 2 and 6 especially broader than those of pereopod 1; palm oblique. Article 5 of pereopods 2, 3 with 1 posterior spine; palm of article 6 with a proximal thumb and row of 12 spines laterally. Pereopods 4-7 dissimilar to pereopods 1-3, subequal. Article 4 of pereopods 4-7 setose, strongly lobed posteriorly, the lobe reaching about $\frac{1}{3}$ way along the posterior margin of article 6 on pereopod 4 and just beyond end of article 5 on pereopod 7; article 5 triangular, with 4-5 strong posterior spines; article 6 with 6-7 stout posterior spines, article 7 barely tapering, with 1 short and 1 long spine terminally.

Uropodal endopod setose, triangular, almost 3 times as long as wide, about $\frac{3}{4}$ as long as peduncle; exopod broad (about $\frac{2}{3}$ as wide as long), not apically notched, folded over telson. Telson reaching almost halfway along endopod, dorsally concave, more or less parallel-sided, terminally two rounded lobes separated by a strong apical notch; statocyst opening by a proximal dorsal pore; 1 pair of simple setae and 1 pair of 'brush-setae' in the terminal notch and many setae on the dorsal surface of telson.

Male: Differs from the above description in more elongate pleon; more setose and more elongate palm on pereopod 1; setose flagellum of antenna 1 with 11-14 articles reaching back to middle of pereonite 1; appendix masculinis a simple rod exceeding the inner ramus of pleopod 2 by about $\frac{1}{3}$ its length and exceeding the outer ramus.

Material examined: 4 males, 3 females, 12 juveniles; 7-11 mm.

Holotype: QM W6124, juvenile, 10.7 mm.

Type locality: QUEENSLAND. Middle Banks, Moreton Bay, clean sand, 9-10 m, collected by S. Cook and S. Newlands for the University of Queensland Moreton Bay benthic studies, December 1973.

Paratypes:

QUEENSLAND: Middle Banks, Moreton Bay, 9-10 m, QUBS samples: QM W6135 (1 specimen), QM W6139 (1), QM W7349 (5).

Other material:

QUEENSLAND: Middle Banks, Moreton Bay,



Figure 19—*Ulakanthura namoo*. Holotype (QM W7348): a, head; b, tail fan; c, mandible; d, maxilliped. Male (QM W6140, QUBS sample): e, pleopod 2.

9-10 m, QUBS samples: QM W7351 (3 specimens), AM P25458 (4 specimens), NMV J513 (4).

Distribution: Southern Queensland, clean sand, 9-10 m.

Remarks: This species is closest to *U. lara* from Victoria differing in the form of the telson and length of the appendix masculinis of the male.

The aboriginal word 'wanda' means 'sand hills'.

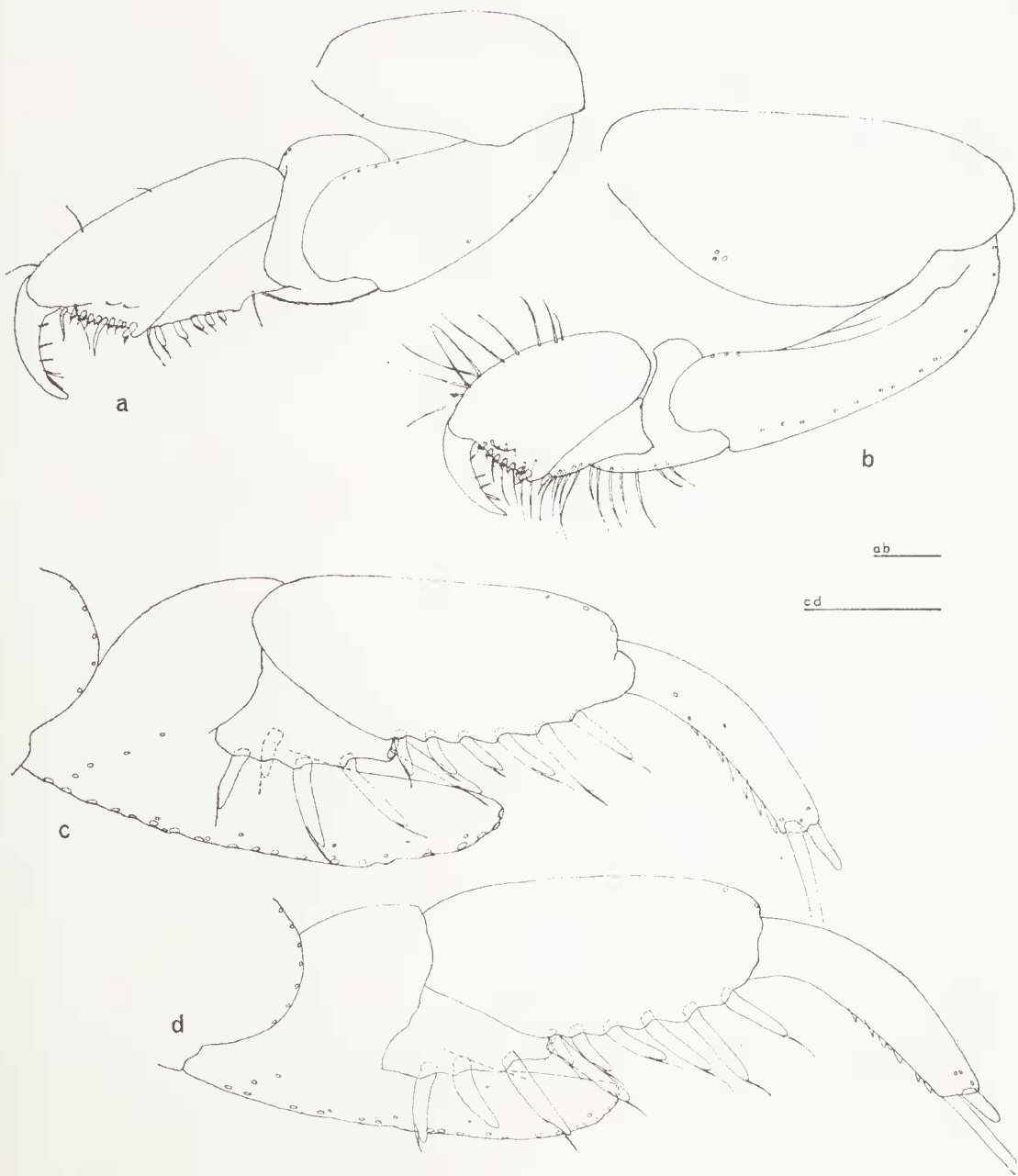


Figure 20—*Ulakanthura namoo*. Holotype (QMW7348): a, b, c, d, pereopods 1, 2, 4, 7.

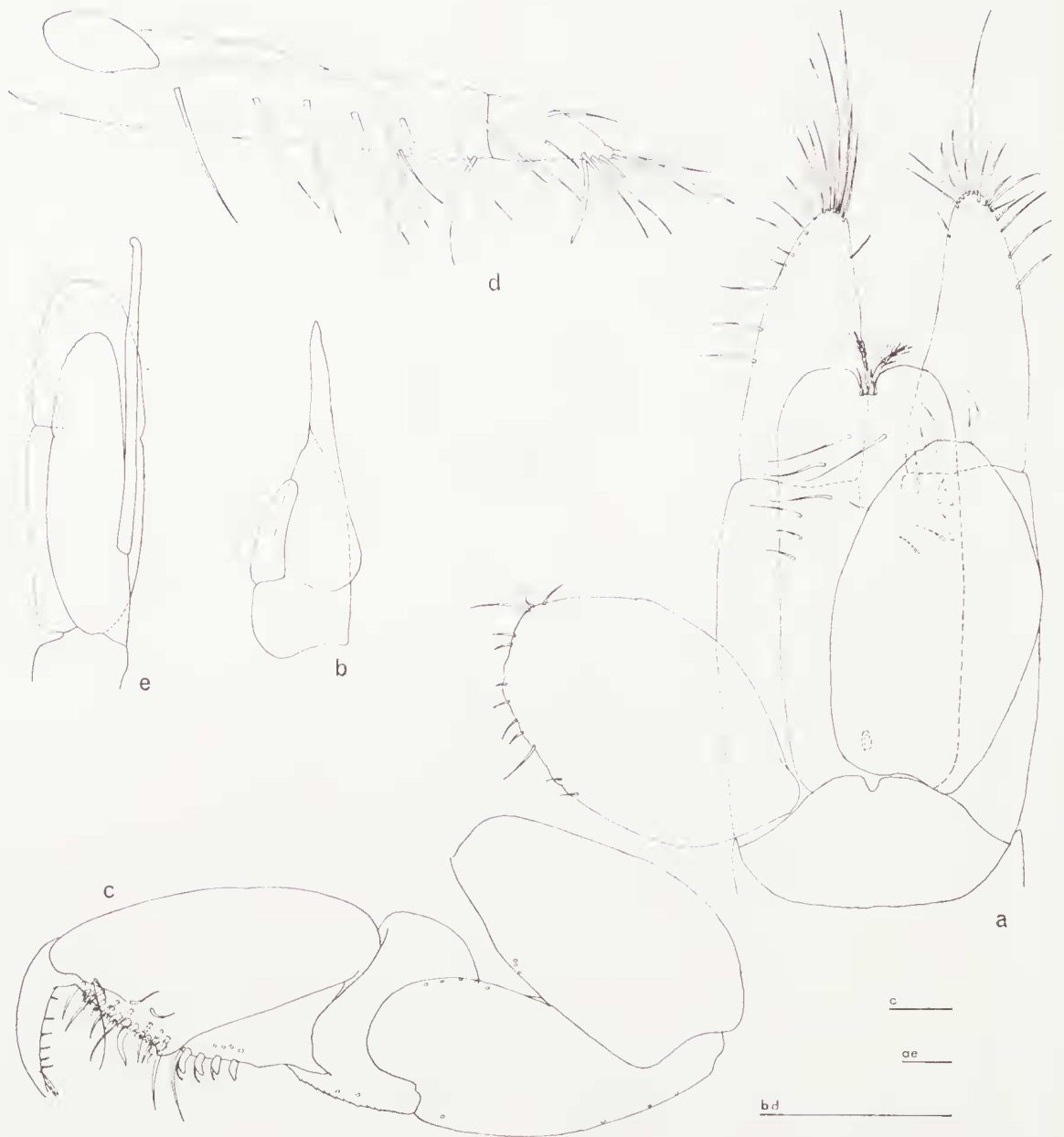


Figure 21—*Ulakanthura wanda*. Holotype (QM W6124): a, tail fan; b, mandible; c, pereopod 1. Male (QM W6135, QUBS sample): d, maxilliped; e, pleopod 2.

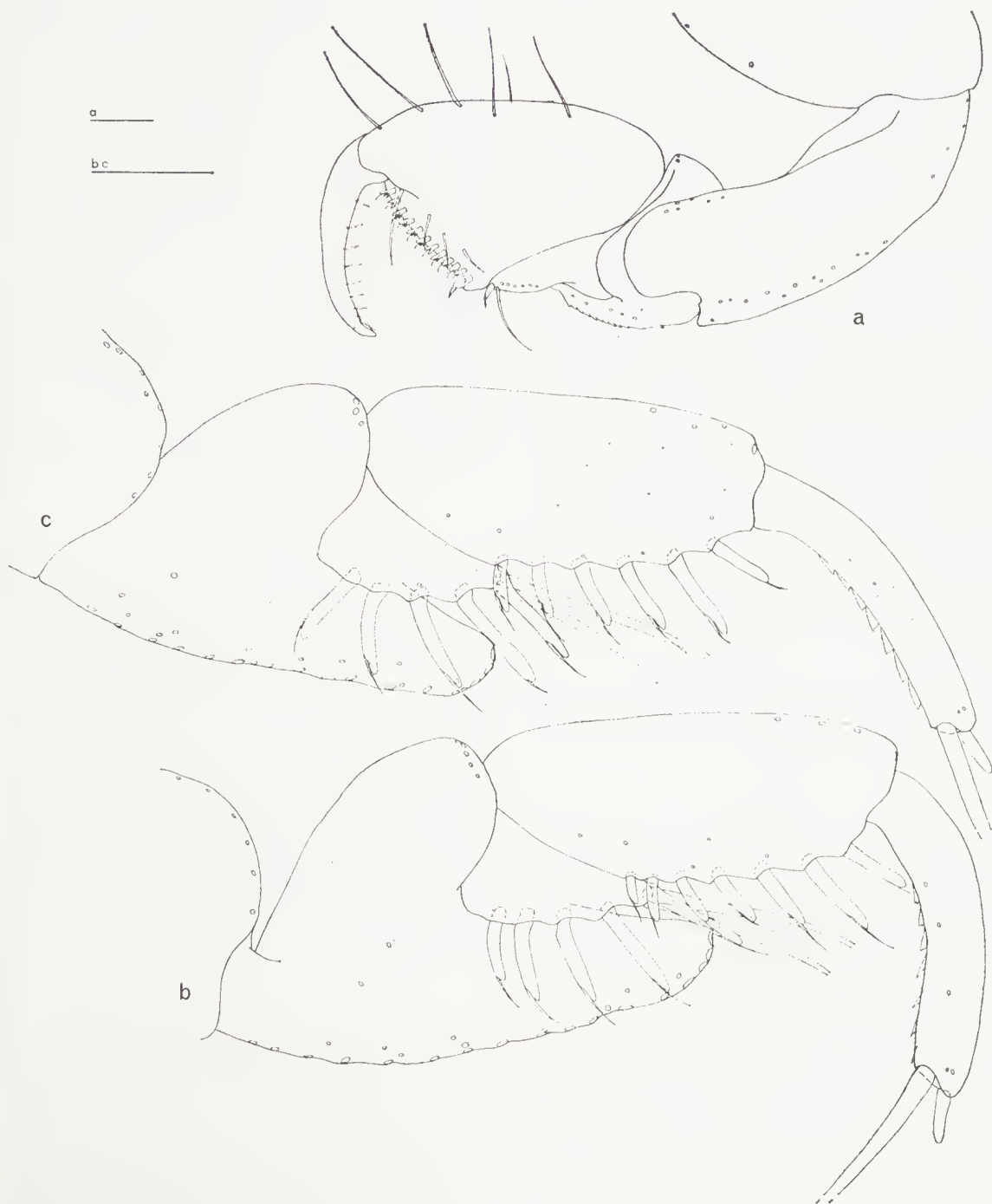


Figure 22—*Ulakanthura wanda*. Holotype (QM W6124): a, b, c, pereopods 2, 4, 7.

NOMEN DUBIUM

Paranthura australis Haswell

Paranthura australis Haswell 1881: 477-8, pl. 18, fig. 4.—Haswell, 1882: 304-5.

Leptanthura australis. — Barnard, 1925: 151. —Nierstrasz, 1941: 242 (part).

not *Paranthura australis*. Miers, 1884: 311. Haswell, 1884: 1012 (= *Apanthura cop-pingeri* Barnard, 1925).

Remarks: Haswell (1881) described and illustrated an anthuridean from Port Jackson in very general terms. None of the characters described by Haswell is sufficiently diagnostic to allow the name to be applied to any presently known species. Moreover, two specimens (AM P3315) in the Old Collection of the Australian Museum labelled '*Paranthura australis*, Hasw Variety 524 Port Jackson' cannot be reconciled with Haswell's description and figures. Both are males, probably of the genus *Paranthura*. Haswell did not designate types (Barnard, 1974) although many of the specimens examined by him remain in the Australian Museum collections. It appears that AM P3315 was allocated to *P. australis* (Number 524 in Haswell's (1882) catalogue) in error at a later date.

The name *Paranthura australis* Haswell is therefore nomen dubium, not certainly applicable to any known taxon.

Discussion

Leptanthura, *Bullowanthura*, *Ulakanthura*, and possibly the monotypic genus *Neoanthura*, are separated from the remaining paranthurids by possessing a triangular article 5 on pereopods 4-7. They also share loss of eyes, some reduction of the mandibular palp, and consistent form of the maxilliped. A review of paranthurid genera in preparation by me shows that the group forms one of the major divisions of the family.

It is noteworthy that southeastern Australia is a centre of distribution for this group of genera. *Leptanthura* now includes about 19 species mostly from bathyal regions. Three species are recorded here from Australia, two from sublittoral environments (less than 200 m). The monotypic genus *Bullowanthura* is

endemic to the region as are all species of *Ulakanthura*. The latter genus is particularly significant in illustrating once again the high degree of speciation found in marine peracarids from southern Australia. Previously I have described ten species of *Haliophasma* (Anthuridac) from southern Queensland, New South Wales and Victoria (Poore, 1975) and Barnard (1972) has discussed at length adaptive radiation in Australian gammaridean amphipods.

The total endemicity of this fauna at the species level and endemicity of two of the three genera makes discussion of its biogeographical relationships difficult. The closest relatives of Australian species of *Leptanthura* seem to be South African species which is unusual for the southeastern Australian fauna. Better appreciation of the origins of these species may be obtained by greater knowledge of the deep-sea isopods of the region.

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References

- BARNARD, J. L., 1972. Gammaridean Amphipoda of Australia, Part I. *Smithson. Contr. Zool.* 103: 1-333.
- , 1974. Gammaridean Amphipoda of Australia, Part II. *Smithson. Contr. Zool.* 139: 1-148.
- BARNARD, K. H., 1925. A revision of the family Anthuridae (Crustacea Isopoda), with remarks on certain morphological peculiarities. *J. Linn. Soc.* 36: 109-160.

- BIRSTEIN, Y. A., 1963. 'Deepsea Isopods from the North-western Pacific.' [In Russian], p. 214. Akademii Nauk, USSR: Moscow.
- HASWELL, W. A., 1881. On some new Australian marine Isopoda. Part I. *Proc. Linn. Soc. N.S.W.* 5: 471-481.
- , 1882. 'Catalogue of the Australian Stalk- and Sessile-eyed Crustacea.' p. xxiv, 326. Australian Museum: Sydney.
- , 1884. A revision of the Australian Isopoda. *Proc. Linn. Soc. N.S.W.* 9: 1001-1014.
- KENSLEY, B., 1975. Marine Isopoda from the continental shelf of South Africa. *Ann. S. Afr. Mus.* 67: 35-89.
- MENZIES, R. J., 1962. The isopods of abyssal depths in the Atlantic Ocean. *Vema Res. Ser.* 1: 79-206.
- MIERS, E. J., 1884. Crustacea. p. 178-322 in 'Report on the Zoological Collections made in the Indo-Pacific Ocean during the Voyage of H.M.S. 'Alert', 1881-2.' Brit. Mus. (Nat. Hist.): London.
- NIERSTRASZ, H. F., 1941. Die Isopoden der Siboga-Expedition. IV. Isopoda Genuina. III. Gnathii-
dea, Anthuridea, Valvifera, Asellota, Phreati-
coidea. *Siboga Exped.* 32d: 235-308.
- POORE, G. C. B., 1975. Australian species of *Haliophasma* (Crustacea: Isopoda: Anthuridae). *Rec. Aus. Mus.* 29: 503-533.
- SARS, G. O., 1899. 'An Account of the Crustacea of Norway. Vol. II. Isopoda.' p. x, 270. Bergen Museum: Bergen.
- STEBBING, T. R. R., 1905. On the Isopoda. *Rept Govt Ceylon Pearl Oyster Fisheries Gulf Manaar, Part 4, Suppl. Rept* 23: 1-64.
- WOLFF, T., 1956. Isopoda from depths exceeding 6000 metres. *Galathea Rep.* 2: 85-159.